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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 5, NUMBER 12
JUNE 15, 1972

W72-06579 -- W72-07278

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WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 5, NUMBER 12
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Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 06E.
W72-06869

1B. Aqueous Solutions and Suspensions

HEATS AND ENTROPIES OF TRANSPORT OF IONS IN AQUEOUS SALINE SOLUTIONS,
Boston Coll., Chestnut Hill, Mass.
For primary bibliographic entry see Field 03A.
W72-06596

02. WATER CYCLE

2A. General

APPLICATION OF A DIGITAL HYDROLOGIC SIMULATION MODEL TO PIEDMONT WATERSHEDS,
Clemson Univ., S.C. Water Resources Research Inst.
James T. Ligon, and Albert G. Law.
Available from the National Technical Information Service as PB-208 022, $3.00 in paper copy, $0.95 in microfiche. Report No. 26, South Carolina Water Resources Research Institute, Clemson, February 1972, 38 p, 22 fig, 3 tab, 10 ref. OWRR A-010-SC (5) and S-019-SC (1).

Descriptors: *Hydrologic models, *Simulation analysis, Runoff, Soil moisture, Infiltration, Groundwater, Evapotranspiration, *Model studies, *South Carolina, *Streamflow forecasting, *Watershed management.
Identifiers: *Piedmont (So Car), *Stanford Watershed Model, Digital hydrologic simulation model.

A version of the Stanford Watershed Model was applied to two watersheds in the South Carolina Piedmont. One watershed was 0.877 square miles and the other 44.0 square miles in area. In the case of the smaller watershed detailed attention was given to the influence of various model parameters on streamflow for specific time intervals (annual, monthly, daily, and individual storms). Different parameters have distinctly different influences in this regard. Very good prediction of annual streamflow and reasonably good prediction of monthly streamflow were attained. Storm hydrographs were simulated less accurately. Peak flow rates were particularly poorly matched on the smaller watershed, although the times of occurence of hydrograph peaks were accurately simulated. However, high flow frequency curves for simulated and recorded flows were in acceptable agreement.
W72-06602

A SYNOPTIC STUDY FOR EVALUATING THE ROLE OF THE GREAT LAKES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 02H.
W72-06689

IN HYDROLOGY H IS A HOUSEHOLD WORD,
Thomas J. Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 04A.
W72-06785

GENERATION AND TESTING OF RANDOM NUMBERS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-06790

A MATHEMATICAL MODEL OF THE WHITE NILE SYSTEM UPSTREAM OF PAKWACH, TECHNICAL NOTE,
Ministry of Mineral and Water Resources, Entebbe (Uganda). Dept. of Water Development.
For primary bibliographic entry see Field 02H.
W72-06795

MATHEMATICAL PROPERTIES OF THE KINEMATIC CASCADE,
Water Resources Engineers, Inc., Walnut Creek, Calif.
D. F. Kibler, and D. A. Woolhiser.
Journal of Hydrology, Vol 15, No 2, p 131-147, February 1972. 7 fig, 2 tab, 11 ref.

Descriptors: *Simulation analysis, *Mathematical models, *Overland flow, *Unsteady flow, Dimensional analysis, Hydrographs, Rainfall-runoff relationships.
Identifiers: *Kinematic wave theory, *Kinematic cascade models.

A kinematic cascade is defined as a sequence of n discrete overland flow planes or channel segments in which the kinematic wave equations are used to describe the unsteady flow. Each plane or channel is characterized by a length, width, and roughness-slope factor. Outflow from the kth plane, along with the parameters for planes k and (k + 1), establishes the upstream boundary condition for plane (k+1). Nondimensional equations are presented for the kth element in a kinematic cascade. Properties of the solutions for a kinematic cascade with pulsed lateral inputs are examined. Kinematic shock waves develop whenever a given criterion is met. These shock waves represent discontinuities in the flow field and produce vertical segments in the outflow hydrographs. The magnitude of the shock and its effect on the outflow hydrograph can be appreciable for realistic parameter values. (Knapp-USGS)
W72-06800

HYDROLOGIC COMPUTATIONS (GIDROLOGICHESKIYE RASCHETY),
K. P. Klibashev, and I. F. Goroshkov.
Gidrometeoizdat, Leningrad, 1970. 460 p.

Descriptors: *Hydrologic data, *Mathematical studies, *Runoff, *Average runoff, Rivers, River basins, Lakes, Reservoirs, Sediments, Hydrography, Meteorology, Snow surveys, Water balance, Precipitation (Atmospheric), Evaporation, Flood discharge, Storm runoff, Hydrograph analysis, Probability, Seasonal.
Identifiers: *USSR, Skewness.

This handbook is a substantially revised edition of the test entitled 'Hydrologic Computations,' prepared by A. I. Chebotarev and K. P. Klibashev and published in 1956. The book is a collection of fundamental formulations and sample computations of runoff phenomena, illustrated by numerous tables, maps, and graphs. Topics include: (1) hydrography of rivers; (2) hydrometeorology of river basins, (3) average annual streamflow; (4) seasonal distribution of runoff; (5) minimum and maximum water discharges; (6) calculation of flood-discharge hydrographs; and (7) silting of reservoirs. The book has been approved by the USSR Ministry of Higher and Secondary Specialized Education for use as a general reference on hydrology at hydrometeorological institutes and universities and should prove useful to specialists in hydrology and hydraulic engineering and to scientific workers in these respective fields. (Josefson-USGS)
W72-06802

WATER BALANCE STUDY OF THE GROUND WATER ON THE LOWER PART OF THE RIVER FUJI,
Tokyo Univ. of Education (Japan). Geographical Inst.; and Tokyo Univ. of Education (Japan). Geological and Mineralogical Inst.
For primary bibliographic entry see Field 02F.
W72-06909

HYDROLOGICAL FORECASTING.

Proceedings of WMO/Unesco Symposium on Hydrological Forecasting, Queensland, Australia, 1967: World Meteorological Organization Technical Note No 92, 1969. 325 p.

Descriptors: *River forecasting, *Flood forecasting, *Weather forecasting, Data collections, Model studies, Runoff forecasting, Water management (Applied), Warning systems, International Hydrological Decade.
Identifiers: World Meteorological Organization.

An international symposium was organized jointly by the World Meteorological Organization, Unesco, and the Government of Australia on hydrological forecasting. The principal theme was the forecasting of rainfall floods, especially for short time-intervals. The program of the symposium includes not only forecasting techniques, but data acquisition. The types of observation most common in short-range flood prediction include river stage, precipitation, snow-pack characteristics, and the factors influencing evapotranspiration. Reports of river stage (or discharge) serve to monitor and adjust forecasts derived from precipitation and snow melt. Shifts in the stage-discharge relation during the passage of a flood wave can be the source of major errors in forecasting, particularly in alluvial channels. Basic data networks are designed to meet all future requirements for long-term data series. The design of a network, as characterized by the station density, is largely a question of economics. The variation of forecast accuracy with station density usually can be evaluated by analyzing historical data. Forecasting requirements are largely dependent upon the level of economic development. Regardless of the stage of development, however, most countries suffer appreciable damage due to the ravages of floods. Having satisfied the initial need for flood warnings, the service can be improved in accord with requirements of the national economy. (See W70-07172 thru W70-07189 and W72-07234 thru W72-07245) (Knapp-USGS)
W72-07233

THE HYDROLOGICAL CYCLE--ITS PHYSICAL BASIS AND ITS PREDICTABILITY,
Weather Bureau, Silver Spring, Md.
J. Smagorinsky.
In: Proceedings of WMO/Unesco Symposium on Hydrological Forecasting, Queensland, Australia, 1967: World Meteorological Organization Technical Note No 92, p 3-4, 1969.

Descriptors: *Hydrologic cycle, *Mathematical models, *Atmosphere, *Atmospheric physics, Air circulation, Climatology, Humidity.

A numerical general circulation model uses a simple hydrologic cycle consisting of advection of water vapor by large-scale motion, evaporation from the surface, precipitation, and an artificial adjustment to simulate the process of moist convection. The radiative flux is computed for the climatological distribution of water vapor. Conditions consist of a completely dry and isothermal atmosphere. A state of quasi-equilibrium is obtained as a result of the time integration of 187 days. A preliminary analysis of the result is performed for the 40-day period from 148th day to 187th day. According to this model, the hemispheric mean of the rate of precipitation is about 1.06 m/yr. An extremely large export of water vapor takes place from the dry subtropics into the wet tropics by meridional circulation. In the troposphere, relative, humidity increases with decreas-

ing altitude. In the stratosphere it is very low except at the tropical tropopause, and the mixing-ratio of water vapor is extremely small. Water vapor is transported from the troposphere into the stratosphere, and then transported toward low latitudes where it condenses at the tropical tropopause. In middle latitudes, the poleward transport of total energy in the moist-model atmosphere is less than that in the dry-model atmosphere because of the effect of the poleward transport of latent energy or the heat of condensation. (See also W72-07233) (Knapp-USGS)
W72-07234

THE SOIL-PLANT-ATMOSPHERE CONTINUUM IN THE HYDROLOGICAL CYCLE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
J. R. Philip.
In: Proceedings of WMO/Unesco Symposium on Hydrological Forecasting, Queensland, Australia, 1967: World Meteorological Organization Technical Note No 92, p 5-13, 1969. 1 fig, 31 ref.

Descriptors: *Evapotranspiration, *Evaporation, *Soil-water-plant relationships, Hydrologic cycle, Microenvironment, Soil moisture, Thermodynamics.

The process of water loss in the atmosphere from soils and plants involves the transfer of water and heat in the three domains of the soil, the plant, and the atmosphere. Thermodynamics provides a basis for treating the processes in these various domains in a unified way. The connection between moisture potential and relative humidity, together with the identification of soil moisture potential and plant water potential, enables calculation of both liquid-phase transport processes in the soil and the plant, and vapor-phase processes in soil, plant, and atmosphere as occurring down gradients of total potential. The process of uptake of soil-water by plant roots can be studied by describing the flow processes through the soil to the root surfaces. Study of the water loss from bare soils requires consideration of the transfer processes for heat and water in both soil and atmosphere. To a good approximation, these were three stages in the drying out of an initially saturated soil profile. So long as the soil is sufficiently moist, the evaporation rate is indistinguishable from that for a saturated surface. At intermediate moisture contents, evaporation depends only on the soil moisture distribution. When the surface layers are sufficiently dry, evaporation is sensitive to the heat flux in the soil, and a negative correlation between actual and potential evaporation may follow. (See also W72-07233) (Knapp-USGS)
W72-07235

PREDICTION ASPECTS OF THEORETICAL MODELLING OF LARGE-SCALE PATTERNS,
Weather Bureau, Silver Spring, Md.
J. Smagorinsky.
In: Proceedings of WMO/Unesco Symposium on Hydrological Forecasting, Queensland, Australia, 1967: World Meteorological Organization Technical Note No 92, p 27, 1969.

Descriptors: *Weather forecasting, *Climatology, *Mathematical models, *Weather patterns, Synoptic analysis, Meteorology.

Two-week weather predictions were made for two winter cases by applying a high-resolution, hemispheric, nine-level, moist general-circulation model. The experiment succeeded in forecasting the birth of second- and third-generation extratropical cyclones and their behavior thereafter. The correlation coefficients between the observed and the 14th-day forecast patterns for the change of 500-mb geopotential height from the initial time were 0.5 for one test and 0.4 for another. There are, however, several defects in the model. The forecast temperature was too low. In the flow pattern, the intensities of the highs and lows weakened appreciable after six or eight days, reflecting the fact that the forecast of eddy kinetic energy was less than the observed. On the other hand, the intensity of the tropospheric westerlies was too great. (See also W72-07233) (Knapp-USGS)
W72-07236

RESEARCHES IN INDIA ON OBJECTIVE PRECIPITATION ASSESSMENT,
S. Banerji, and D. V. L. N. Rao.
In: Proceedings of WMO/Unesco Symposium on Hydrological Forecasting, Queensland, Australia, 1967: World Meteorological Organization Technical Note No 92, p 28-36, 1969. 3 fig, 3 tab, 9 ref.

Descriptors: *Weather forecasting, *Synoptic analysis, *Monsoons, *Precipitation (Atmospheric), Meteorology, Climatology, Atmospheric physics, Air circulation.
Identifiers: *India.

Despite the two major impediments of a sparse aerological network and lack of high-speed computational facilities, objective precipitation assessment is used in India. The results are applicable only to the tropics where the monsoon is the principal rain-producing agency. The maximum precipitation appears to come from the layer two to three kilometers above sea level. For a given value of water content in a layer there appears to be a limiting value of precipitation rate which increases with vertical velocity up to a certain speed, but higher speeds do not result in any increase in the rate of precipitation. In the method of assessment of rainfall by dynamic trajectories, the area of maximum rainfall is not located at the point of convergence but some distance upstream. In most cases of heavy rain not more than 80-85% of the total inflow volume of moisture was precipitated. (See also W72-07233) (Knapp-USGS)
W72-07237

A CYCLONIC DISTURBANCE IN THE UPPER TROPOSPHERE ASSOCIATED WITH WIDESPREAD RAIN OVER SOUTH-EASTERN AUSTRALIA,
New Zealand Meteorological Service, Wellington.
H. W. Hill.
In: Proceedings of WMO/Unesco Symposium on Hydrological Forecasting, Queensland, Australia, 1967: World Meteorological Organization Technical Note No 92, p 37-50, 1969. 11 fig, 7 ref.

Descriptors: *Synoptic analysis, *Precipitation (Atmospheric), *Australia, *Atmospheric physics, Cyclones, Anticyclones, Climatology, Meteorology, Winds, Weather forecasting, Weather patterns.

The period April 20-23, 1964 began with an intense anticyclone centered over the southern Tasman Sea and extending over eastern Australia. On April 21 rains of 1 to 2 inches were reported over a wide area. A well-defined cyclonic disturbance, moving rather slowly eastwards across southeastern Australia, was evident on the upper-level maps. Isentropic analysis clearly demonstrates the relationship between the rain areas and the ascending moist air in a manner which cannot be seen from the sea-level analysis. Depressions of this type often lie just on the southern edge of the subtropical jet stream. Within the core of the depression, air with fairly low wet-bulb temperature may be encountered, suggesting the advection of air from higher latitudes at some stage of the development of the cutoff. The depression is preceded by a broad belt in which a general large-scale up-sliding motion of the air takes place. Probably, once the cloud and precipitation process has been initiated, this air passes from isentropic surfaces of lower to higher value by saturated adiabatic ascent. Extensive areas of slow up-sliding motion can exist without well-defined thermal fronts. Even where significant temperature gradients do exist they can occur as the result of horizontal variations in the field of vertical motion. In the same way well-defined thermal fronts often cannot be found either at the surface or aloft in well-developed sea-level depressions. (See also W72-07233) (Knapp-USGS)
W72-07238

WIDESPREAD HEAVY RAIN IN NEW ZEALAND ASSOCIATED WITH CYCLOGENESIS OVER THE NORTH-WESTERN TASMAN SEA,
New Zealand Meteorological Service, Wellington.
H. W. Hill.
In: Proceedings of WMO/Unesco Symposium on Hydrological Forecasting, Queensland, Australia, 1967: World Meteorological Organization Technical Note No 92, p 51-65, 1969. 10 fig, 5 ref.

Descriptors: *Synoptic analysis, *Precipitation (Atmospheric), *Australia, *Atmospheric physics, Cyclones, Anticyclones, Climatology, Meteorology, Winds, Weather forecasting, Weather patterns.
Identifiers: *New Zealand.

During the period April 25-26, 1966 there were widespread heavy falls of rain over New Zealand, two inches of rain a day being fairly common over much of the North Island and the northern parts of the South Island. In some areas there were over four inches a day. This was associated with a depression which developed off the Queensland coast, subsequently moving southeastwards. Conventional frontal analysis failed to give an adequate explanation of the weather distribution, and three-dimensional motion of the air was therefore studied by isentropic analysis. There was at this time a strong jet stream over southern New Zealand and a very deep northwesterly stream was ascending into the entrance on the lower-latitude side of this jet. Within the area of the strongly ascending air and heavy precipitation a new depression developed just west of central New Zealand. Even at the very intense stage of development there was little evidence of significant zones of potential temperature gradient at any tropospheric level, and the only semblance of a warm front lies in the humidity distribution. In the lower latitudes of the Tasman Sea and over the South Pacific strong cyclogenesis with extensive, well-organized cloud-sheets is a common occurrence. It is unlikely that any preexisting thermal fronts can provide the necessary potential energy, and much more plausible that the energy is provided from the kinetics of the major hemispheric flow patterns. (See also W72-07233) (Knapp-USGS)
W72-07239

FORECASTING WATER-LEVELS OF THE ORINOCO RIVER IN VENEZUELA,
H. Silva, and L. Ayala Useche.
In: Proceedings of WMO/Unesco Symposium on Hydrological Forecasting, Queensland, Australia, 1967: World Meteorological Organization Technical Note No 92, p 133-138, 1969. 5 fig, 1 tab.

Descriptors: *Low flow, *Stage-discharge relations, *River forecasting, *Streamflow forecasting, *South America, Flood forecasting, Water levels, Navigation, Data collections, Hydrologic data.
Identifiers: *Orinoco River (Venezuela).

Few gagings have been made in the Orinoco River, for which reason no defined rating curves are available for any section. The few sporadic gagings made have been used to try to establish the stage-discharge relation at Ciudad Bolivar and San Felix, but inconclusively. Hydrographs from Ciudad Bolivar, Puerto Ayacucho and San Felix show the Orinoco to be a river with a well-defined annual flood and ebb regime, as is to be expected considering its large size. Every year, in April, the river begins to rise steadily until it reaches its peak, sometimes during the latter part of August and sometimes during the first ten days of September. Then the waters begin to recede at the average rate of six centimeters daily during 200

days. Direct gaging and indirect appraisal show coinciding discharge results averaging 21,000 cumecs at Ciudad Bolivar from a tributary basin of nearly 800,000 sq km. The main interest at present is in forecasting the extreme low levels at low water, generally during the month of March, and the flood levels, approaching instantaneous peak, at least 30 days in advance. Using the level taken during one day of the month of June, the rainfall data for the 15 preceding days, the forecast of the rains to come until August 20, and the rate of rise for the five days preceding the issuing of the forecast gives good results. Hydrologic simulation using the Stanford Watershed model is proposed to establish discharge curves at Ciudad Bolivar and Puerto Ayacucho, and to develop procedure for forecasting at Ciudad Bolivar as affected by tributary reservoirs, irrigation systems and diversions. (See also W72-07233) (Knapp-USGS)
W72-07240

APPLICATIONS OF DISCHARGE AND WATER-LEVEL FORECASTS,
Comite National Francaise de Geodesie et Geophysique, Rueil-Malmaison. Section d'-Hydrologie Scientifique.
L. Serra.
In: Proceedings of WMO/Unesco Symposium on Hydrological Forecasting, Queensland, Australia, 1967: World Meteorological Organization Technical Note No 92, p 211-219, 1969.

Descriptors: *River forecasting, *Streamflow forecasting, Water resources development, Water management (Applied), Flood control, Water supply, Reviews.

Good water management requires accurate knowledge of both existing and future resources obtained by using hydrological inventory and hydrological forecasting. Reservoir stations are not exempt from the effects of the irregularity of flows, but thanks to their storage capacity they have the great advantage of being able to postpone the reduction of output until such time as there is practically no further need of the hydraulic energy previously stored. In this way reliability of distribution is guaranteed, at least in principle, by the accumulation of reserves. But for the economic and rational management of these reserves, it is important to know what they will be in the future. The advantages accruing from the integrated development of a river basin far outweigh the disadvantages. It should always be possible, at the economic level, to find compromise solutions to the disagreements which may arise either at the planning or the operating stage. Only hydrological forecasting can render such disputes more flexible and more rational. (See also W72-07233) (Knapp-USGS)
W72-07241

FLOOD WARNINGS--THE ROLE OF THE NEW SOUTH WALES CIVIL DEFENCE ORGANISATION,
Civil Defence Organization, Sydney (Australia).
I. N. Dougherty.
In: Proceedings of WMO/Unesco Symposium on Hydrological Forecasting, Queensland, Australia, 1967: World Meteorological Organization Technical Note No 92, p 220-226, 1969. 2 append.

Descriptors: *Flood forecasting, *Warning systems, *Australia, Flood protection, River forecasting.
Identifiers: *New South Wales (Australia).

Unlike places which have well-defined wet and dry seasons, New South Wales, Australia can and does have floods at any time of the year. Records kept since the beginning of 1956 reveal that there was either a flood alert or actual flood operations for 12 days in February, 1957; 24 days in April, 1957; 20 days continuously in June, 1967; every day in August and September, 1956; 20 days in October, 1964; and 19 days in November, 1966. In fact there have been only 51 days since 1 January 1956 without either flood alerts or actual flood operations. The charter of the New South Wales Civil Defence Organisation charges the Director with the responsibility for all aspects of flood warning, one of which is flood-height forecasts. The Civil Defence Organisation's flood-height forecasts are calculated at the headquarters in affected areas from information collected, collated and interpreted there. The forecasts are then communicated to the public by every means available, and as frequently as possible. (See also W72-07233) (Knapp-USGS)
W72-07242

THE OPERATION OF SOMERSET DAM--A MULTI-PURPOSE PROJECT (AUSTRALIA),
Water Supply Design Office, Brisbane (Australia).
G. Cossins.
In: Proceedings of WMO/Unesco Symposium on Hydrological Forecasting, Queensland, Australia, 1967: World Meteorological Organization Technical Note No 92, p 242-260, 1969. 3 fig, 2 tab, 12 ref.

Descriptors: *Reservoir operation, *Water management (Applied), *Flood control, *Water supply, *Australia, Reservoir releases, Reservoir storage, Water allocation (Policy).
Identifiers: Somerset Dam (Australia).

Somerset Dam, New South Wales, Australia is a multi-purpose project. It provides 90% of the headworks storage for the Brisbane Water Supply System and is also operated to achieve a significant degree of flood mitigation in the Lower Brisbane Valley and in the City of Brisbane. Hydroelectric power generation and irrigation are minor functions of this project and, in addition, the reservoir is used for recreational activities and is a tourist attraction. The dam is situated on the Stanley River four miles above its confluence with the Brisbane River and 138 miles, by river, from the mouth of the latter. The various functions of Somerset Dam are not mutually consistent and a compromise is necessary to ensure the most effective use of the reservoir. Priority is given to urban water supply and flood mitigation, and other functions are, with reservations, entirely dependent on the main ones. The extreme variations of flood and drought in the Brisbane Valley make seasonal management impracticable. At Somerset Dam it is necessary to reserve the lower 40% of the storage for water-supply purposes and the upper 60% for flood mitigation, and the division line between them is called the permanent water-supply level. Following a flood, the level of the reservoir is reduced to the permanent water-supply level as rapidly as possible consistent with the mitigation of flooding in the Brisbane River. When the reservoir is below this level the main consideration governing releases is the requirements of the Brisbane Water Supply System. (See also W72-07233) (Knapp-USGS)
W72-07243

AUTOMATIC INSTRUMENTATION FOR TELEMETERING RAIN AND RIVER-LEVEL DATA FROM REMOTE STATIONS,
S. V. Datar, and P. Mohammed.
In: Proceedings of WMO/Unesco Symposium on Hydrological Forecasting, Queensland, Australia, 1967: World Meteorological Organization Technical Note No 92, p 300-306, 1969. 5 fig.

Descriptors: *Telemetry, *Data collections, *Hydrologic data, *Data transmission, *Meteorological data, Networks, Rain gages, Water levels.
Identifiers: *India.

In addition to giving rainfall information in the shortest possible time from uninhabited mountainous areas where the support of a manned station is either too difficult or too costly, telemetry equipment produces data of greater reliability than those an ordinary observer in such regions can provide. It can also be adapted to report river-gage data as well as meteorological parameters like atmospheric temperature, humidity, wind speed and direction. A large variety of instruments can be designed to serve this purpose. They have in common: a sensor to measure the parameter-precipitation or water level; a data register to store the intelligence; a programmer for sequencing the instrumental operations; a coding device to encode the data; a clock for initiating the telemetering action at regular predetermined intervals; a suitable radio transmitter, receiver and antennas; and a power-supply unit. The Instrument Division of the India Meteorological Department has, over the last few years, carried out experiments to design and develop systems for the automatic telemetering of rainfall and river-stage data to receiving stations up to 100 km from the field units. (See also W72-07233) (Knapp-USGS)
W72-07244

THE COMPUTATION AND FORECASTING OF MAXIMUM FLOOD DISCHARGES,
A. B. Kryzhanovska, and G. V. Pavlenko.
In: Proceedings of WMO/Unesco Symposium on Hydrological Forecasting, Queensland, Australia, 1967: World Meteorological Organization Technical Note No 92, p 320-325, 1969. 3 fig, 7 ref.

Descriptors: *Flood forecasting, *Peak discharge, *Runoff forecasting, Recession curves, Hydrograph analysis, Base flow, Overland flow.
Identifiers: *USSR.

The procedure of flood-discharge forecasts of mountain rivers in the USSR is based on determination of the inflow of rain and snow-melt waters to the upstream cross-sections of rivers, and on calculation of the transformation of flood waves while they pass the river section to the outlet. Determination of water inflow to the river is by means of observational data on water runoff in upper cross-sections in cases when high accuracy is required or by means of observations of precipitation in the basin if it is necessary to extend the period of forecast. Maximum flood discharges are correlated with runoff volume per flood, which in turn is determined by the equation of water balance; in which the runoff depth of the unit flood is a function of x, the sum of excess precipitation for a calculation time interval, and n, the basin humidification characteristic. In mountain basins with no direct observational data for humidification of the basin, n can be characterized by the pre-flood discharge produced by base flow, by the sum of precipitation which fell before the flood and has not yet reached the groundwater level, and by temperature conditions during the period of flood information, which determine evapotranspiration. The values of runoff per flood are satisfactorily correlated with the excess maximum discharges above base flow. Base flow is determined by the standard recession curve depending on the character of the pre-flood discharge formation. (See also W72-07233) (Knapp-USGS)
W72-07245

2B. Precipitation

THE APPLICATION OF THE ANALYSIS OF VARIANCE TO MEAN AREAL RAINFALL ESTIMATION,
Institute of Hydrology, Wallingford (England).
R. T. Clarke, and K. A. Edwards.
Journal of Hydrology, Vol 15, No 2, p 92-112, February 1972. 1 fig, 9 tab, 6 ref.

Descriptors: *Rainfall, *Distribution patterns, *Statistical models, *Linear programming, *Variability, Statistics, Statistical methods, Rain gages, Network design, Precipitation (Atmospheric), Probability.
Identifiers: Mean areal rainfall.

Mean areal rainfall for a region and a measure of its precision are estimated by a statistical model expressing point rainfall as a linear function of

model parameters. Different assumptions about the nature of the rainfall surface require the estimation of different sets of parameters and lead to different measures of the precision of mean areal rainfall. If this measure of precision is to be used to examine the adequacy of a network of raingauges, then conclusions may be very different according to which set of initial assumptions are adopted. Two components of variance are required to express the precision of mean areal rainfall estimates: a measure of the 'residual' variation in point measures of rainfall; and a measure of the variation in point rainfall from period to period. (Knapp-USGS)
W72-06694

MAPS OF UPPER AIR CURRENTS ABOVE THE EARTH,
Nauchno-Issledovatelskii Institut Aeroklimatologii, Moscow (USSR).
I. G. Guterman.
Soviet Geography: Review and Translation, Vol 12, No 10, p 679-694, December 1971. 4 fig, 3 tab, 29 ref.

Descriptors: *Meteorology, *Currents (Air), *Air circulation, Air masses, Turbulence, Synoptic analysis, *Mapping.
Identifiers: *Zonal air flow, *Meridional air flow.

Starting with the International Geophysical Year and the International Geophysical Cooperation, the Societ Union began constructing air current maps for the northern hemisphere. In the course of subsequent research, it was established that equal attention needs to be given to the vortical component of wind motion, the macroturbulence, and to the mean meridional components of the flows. This led to appearance of maps of the covariant momentums of the zonal and meridional components of winds and other parameters. Maps of the zonal and meridional components of the resultant velocities of upper air currents in January and July are presented, described and analyzed. Seasonal differences between the northern and southern hemispheres are elucidated. Mean meridional component values in both hemispheres decline toward the equator. Along some longitudes this component reaches zero at the equator. The most intensive exchange between hemispheres caused by the mean circulation is observed above oceans in January and above continents in July. (Casey-Arizona)
W72-06732

RAINDROP CHARGE-SIZE MEASUREMENTS IN WARM RAIN,
Hawaii Univ., Hilo. Dept of Meteorology.
T. Takahashi, and C. M. Fullerton.
Journal of Geophysical Research, Vol 77, No 9, p 1630-1636, March 20, 1972. 4 fig, 1 tab, 28 ref. NSF Grants GP-5481, GA-350.

Descriptors: *Precipitation (Atmospheric), *Hawaii, *Rainfall, *Particle size, *Electric fields, Cloud physics, Instrumentation, Data collections.
Identifiers: Electric charge (Raindrops).

Measurements were made of size and electric charge of raindrops falling from warm clouds at Hilo, on the windward coast of the island of Hawaii, during November and December 1970. Most raindrops smaller than 1.4 mm in diameter are negatively charged, whereas larger drops are predominantly positive. Rainfall from shallow cumulus clouds most frequently contains negatively charged raindrops. A tentative model is proposed to explain the observed variation in raindrop size and charge during the development of warm clouds over Hawaii. (Knapp-USGS)
W72-06759

WARM FOG MODIFICATION STUDIES,
Meteorology Research, Inc., Altadena, Calif.
For primary bibliographic entry see Field 03B.
W72-06786

SOVIET WORK AND WRITING IN CLIMATOLOGY,
Wisconsin Univ., Milwaukee. Dept. of Geography.
P. E. Lydolph.
Soviet Geography: Review and Translation, Vol. 12, No. 10, p 637-665, December 1971. 207 ref.

Descriptors: *Climatology, *Bibliography, *Foreign research, Temperature, Precipitation, Heat balance, Radiation, Circulation, Weather, Droughts, Microclimatology, Agroclimatology, Control.
Identifiers: *USSR.

Perhaps half of the climatological literature published in the world today is being written by Soviet climatologists in the Russian language, and some of it represents the foremost work in the field. A discussion is presented of the recent and more significant publications by Soviet climatologists which is subdivided by topic. The topical categories include: general works, climatological thought, radiation and heat balance, atmospheric circulation, temperature and precipitation, severe weather phenomena, drought and related phenomena, microclimate and interface phenomena, agroclimate, melioration and climate control, applied climatology, climatic change, polar areas and climatic classification. A special section of bibliographical materials in the English language is also presented. Soviet climatologists are active in all fields and particularly in such branches as radiation and heat budget studies and agroclimatology. A selected list of Soviet publications includes the most important recent papers on general work, topical and philosophical material and a wealth of literature on subregion climates of the USSR. It contains 207 items. Additional lists include 50 papers translated in Soviet Geography: Review and Translation, Soviet organizations sponsoring research on climate, and Soviet and prerevolutionary climatologists. (Casey-Arizona)
W72-07033

ON ESTIMATING THE WETTING OF WALLS BY DRIVING RAIN,
Ts. A. Shver.
Soviet Geography: Review and Translation, Vol 12, No 10, p 701-710, December 1971. 2 fig, 3 tab, 7 ref. Trans from Trudy, Glavnaya Geofizicheskaya Observatoriya. No. 246, 1969.

Descriptors: *Rainfalls, *Walls, *Penetration, *Environmental effects, *Wind velocity, *Wetting, Latitudinal studies, Estimating equations.
Identifiers: *USSR, *Driving rain, *Rainfall damage.

Rain seldom falls vertically, but usually forms an angle with vertical surfaces. This increases the amount that soaks into walls which frequently causes damage to buildings. Rain accompanied by wind is known as driving rain, which is the most damaging type of rain. The Lacy-Shellard index compares areas with driving rain, and consists of the annual precipitation and mean annual wind velocity product. The index suffers from some limitations: (1) it provides no information about the effect of wind direction; (2) it is computed from mean data while significant moisture penetration into protective surfaces occurs in heavy, prolonged rain; (3) the map of the index does not reflect the effect of local peculiarities; (4) it omits the effect of height of buildings and structures. A more refined driving-rain index is proposed that is the product of total precipitation and frequency of wind speeds more than 5 m/sec. In the European USSR, according to this index, some 30-40% of the total precipitation strikes vertical surfaces north of 55 degrees N latitude. The percentage rises to 70% along the coasts of the Barents Sea, the Baltic Sea and the Gulf of Finland. (Casey-Arizona)
W72-07045

THE IMPACT OF ECONOMIC ACTIVITY ON CLIMATE,
M. I. Budyko, O. A. Drozdov, and M. I. Yudin.
Soviet Geography: Review and Translation, Vol 12, No 10, p 666-679, December 1971. 1 fig, 1 tab, 33 ref. Trans. from Sovremennyye problemy klimatologii, M. I. Budyko, ed. Leningrad: Gidrometeoizdat, 1966.

Descriptors: *Arid lands, *Microclimatology, *Air temperature, *Heat exchange, *Convection, Energy budget, Humidity, Precipitation (Atmospheric), Environmental effects, Mode of action, Forests, Cities, Air pollution, Diurnal, Climates, Vegetation effects, Air masses, Air circulation.
Identifiers: *Climatic changes.

The climatic consequences of a variety of human activities are examined in terms of their effects on local energy balances. Cities consume energy at rapid rates, and lead to increases in local air temperatures. This effect is further heightened by air pollution which attenuates outgoing long-wave radiation. Additionally, the greater surface roughness and higher sensible heat flux during warm periods combine to intensify vertical currents and may result in precipitation increases. Forest canopies tend to absorb more solar energy than open land, which mainly heats the canopy and evaporates water. The absence of wind within the forest and the lessened sensible heat flux tend to smooth diurnal temperature fluctuation. Nighttime cooling is minimized by atmospheric thermal stratification which hinders heat exchange. Deforestation results in a drop in mean annual air temperature and an increase in diurnal range. Irrigation in the arid zone produces significant changes in the heat and water exchange at the air-ground surface. Normally, most incoming radiation in the desert heats the atmosphere through sensible heat flux, the temperature of the air masses rise and relative humidity drops. As a result of irrigation, evaporation increases and the temperature of the ground surface decreases. (Casey-Arizona)
W72-07046

MULTIVARIATE TECHNIQUES FOR SPECIFYING TREE-GROWTH AND CLIMATE RELATIONSHIPS AND FOR RECONSTRUCTING ANOMALIES IN PALEOCLIMATE,
Arizona Univ., Tucson. Lab. of Tree-Ring Research; and Wisconsin Univ., Madison. Center for Climatic Research; and Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
H. C. Fritts, T. J. Blasing, B. P. Hayden, and J. E. Kutzbach.
Journal of Applied Meteorology, Vol 10, No 5, p 845-864, October 1971. 14 fig, 2 tab, 29 ref.

Descriptors: *Precipitation (Atmospheric), *Statistical methods, *Dendrochronology, *Climatic data, *History, Dating, Time, Plant growth, Variability, Environmental effects.
Identifiers: *Tree-ring analysis, *Principle-components analysis, *Multivariate statistics, *North America.

Few long-term climatic records are available for western North America because of low population densities and recent settlement. Although tree rings can be precisely dated and their widths can be used to extend the climatic record backwards in time, the usefulness of this method has been limited. Tree-ring data represent a great variety of responses to the environment which generates an awkward number of variables for data processing. Until recently, it was necessary to select highly stratified samples whose growth has been similarly limited by a small number of environmental variables. Advances in computer processing techniques and multivariate statistical analysis have alleviated some of the data gathering restrictions. Environmental variables are diagrammed and response functions derived which relate ring-width chronologies to seasonal climatic chronologies. A large number of climatic variables were calibrated using multivariate analyses. A series of transfer functions allowed estimates of anomalous climatic variations from the tree-ring records and for periods without which climatic records are available. Reconstruction of the anomalous variations

were obtained back to 1700 A.D. The results indicate that multivariate analysis could well revolutionize dendrochronology by liberating it from the restrictions of arid forest borders and arctic treelines. (Casey-Arizona)
W72-07055

EFFECT OF TOPOGRAPHY ON MICROCLIMATE IN SOUTHWESTERN WISCONSIN,
Forest Service (USDA), La Crosse, Wis. North Central Forest Experiment Station.
R. S. Sartz.
USDA Forest Serv. Res. Paper NC-74, 1972, 6 p, 3 fig, 2 tab, 6 ref.

Descriptors: *Air temperature, *Evapotranspiration, *Snow cover, *Snowpacks, *Solar radiation, *Soil water, Wind velocity, Microclimatology, Climatic data, Melting, Moisture, Rainfall, Sublimation, Wisconsin.
Identifiers: *Terrain effects.

Ridge and coulee terrain has little effect on point rainfall, but snowpack accumulation is affected by degree of slope and aspect. North slopes accumulate about 50 percent more snow. Soil water depletion is little affected by aspect. South slopes receive more insolation than north slopes, but temperature differences are slight and may result more from wind differences than from aspect. Air drainage has a significant effect on nighttime air temperatures in coulee bottoms.
W72-07068

ECONOMICAL CONVERSION OF A MINIATURE NET RADIOMETER TO AN ALL-WAVE HEMISPHERIC RADIOMETER,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 02D.
W72-07072

PRECIPITATION CHARACTERISTICS OF SUMMER STORMS AT HIGH-ELEVATION STATIONS IN UTAH,
Forest Service (USDA), Logan, Utah. Intermountain Forest and Range Experiment Station.
E. E. Farmer, and J. E. Fletcher.
USDA Forest Serv. Res. Pap. INT-110, December 1971, 24 p, 8 fig, 5 tab, 19 ref.

Descriptors: *Rainfall intensity, *Mountains, *Storms, *Thunderstorms, Cloudbursts, Utah, Rain, Floods, Mass curves, Snow.
Identifiers: Rainfall intensity-duration-frequency, *Storm duration, Storm number, Elevation-depth, Rainfall rate, Precipitation depth.

Results of data analyses are presented for 25 precipitation intensity stations on two study areas in central and north-central Utah located at elevations between 4,350 and 10,150 feet msl. All data were collected during the period May 1 to October 31. Each station has 10 or more years of record; one station has 30 years of record. The following analyses were made: (1) record consistency; (2) definition of local precipitation zones; (3) intensity-duration-frequency characteristics; (4) 24-hour depths; (5) monthly depths and number of storms; (6) storm occurrence by hour of the day; and (7) storm occurrence by storm duration. The precipitation zone between 6,500 and 8,000 feet msl is expected to receive the greatest rainfall intensities. There is a trend toward reduced intensities with increasing elevation but the trend is not uniform. However, those precipitation zones that receive the most intense rainfall do not coincide with those zones receiving the greatest depth of rainfall. Generally, rainfall depth increases with elevation, but on one study area the zone that received the greatest depth was not the highest elevation zone. A marked difference in the distribution of storm occurrence by hour between the two study areas is attributed to differences in storm type and to differences in the principal source of summer moisture. Average storm length varies inversely with elevation.
W72-07078

DAILY TEMPERATURES AND PRECIPITATION FOR SUBALPINE FOREST, CENTRAL COLORADO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
A. D. Haeffner.
USDA Forest Serv. Res. Pap. RM-80, December 1971, 48 p, 2 fig, 2 tab, 6 ref.

Descriptors: *Climatic data, *Precipitation (Atmospheric), *Air temperature, Snowfall, Storms, Forests, Rocky Mountain Region, Colorado.
Identifiers: *Experimental watersheds, Subalpine, Fraser Experimental Forest.

Daily maximum and minimum temperatures and precipitation are presented for two subalpine forest stations near Fraser, Colorado. Records were collected over a 33-year period at 9,070 feet. Mean annual temperature was 33 deg F., with the extremes ranging from -40 deg to 91 deg F. Annual precipitation ranged from 17 to 28 inches, with an average of 23 inches. Five years of record at 10,620 feet indicate lower maximum temperatures as well as higher minimums.
W72-07079

EFFECT OF PRECIPITATION ON PINE INCREMENT, (IN RUSSIAN),
For primary bibliographic entry see Field 02I.
W72-07117

HYDROLOGICAL FORECASTING.
For primary bibliographic entry see Field 02A.
W72-07233

THE HYDROLOGICAL CYCLE--ITS PHYSICAL BASIS AND ITS PREDICTABILITY,
Weather Bureau, Silver Spring, Md.
For primary bibliographic entry see Field 02A.
W72-07234

PREDICTION ASPECTS OF THEORETICAL MODELLING OF LARGE-SCALE PATTERNS,
Weather Bureau, Silver Spring, Md.
For primary bibliographic entry see Field 02A.
W72-07236

RESEARCHES IN INDIA ON OBJECTIVE PRECIPITATION ASSESSMENT,
For primary bibliographic entry see Field 02A.
W72-07237

A CYCLONIC DISTURBANCE IN THE UPPER TROPOSPHERE ASSOCIATED WITH WIDESPREAD RAIN OVER SOUTH-EASTERN AUSTRALIA,
New Zealand Meteorological Service, Wellington.
For primary bibliographic entry see Field 02A.
W72-07238

WIDESPREAD HEAVY RAIN IN NEW ZEALAND ASSOCIATED WITH CYCLOGENESIS OVER THE NORTH-WESTERN TASMAN SEA,
New Zealand Meteorological Service, Wellington.
For primary bibliographic entry see Field 02A.
W72-07239

2C. Snow, Ice, and Frost

WATER STRESS AND OCEAN CURRENT MEASUREMENTS AT CAMP 200,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
K. Hunkins.
AIDJEX Bulletin No 12, (Washington University) p 35-60, February 1972. 10 fig, 2 tab, 9 ref. ONR Contract No 0014-67-A-0108-0016.

Descriptors: *Ocean currents, *Arctic Ocean, Drag, Currents (Water), Density currents, Current meters, Freezing, Sea ice, Water circulation, Roughness (Hydraulic).
Identifiers: Camp 200 (Arctic Ocean).

Ocean current observations were made at Camp 200 in the Arctic Ocean, with meters at depths of 5 m, 7 m, 11 m, 19 m, 32 m, and 75 m below sea level. In addition, ten profiles were made at more closely space intervals with a current meter lowered by hand. A roughness length of 0.15 cm was found for the underside of the ice, corresponding to a drag coefficient of 0.0076 at a level 1 m below the ice. A weak boundary current just below the ice appeared during periods in which the ice was almost motionless. The boundary current was 5 m to 20 m thick with a maximum speed of about 5 cm/sec. It is suggested that these are local currents associated with brine produced by sea ice freezing on the bottom. (Knapp-USGS)
W72-06695

WATER AND ICE MOTION IN THE BEAUFORT SEA, SPRING 1970,
Washington Univ., Seattle. Dept. of Oceanography.
L. K. Coachman, and J. L. Newton.
AIDJEX Bulletin No 12 (Washington University), p 61-91, February 1972. 13 fig, 3 tab, 16 ref.

Descriptors: *Arctic Ocean, *Ocean currents, *Winds, Meteorology, Currents (Water), Current meters, Sea ice, Water circulation.
Identifiers: Ekman transport.

The Arctic Ocean contains two layers of circulating water of relatively uniform density which are separated by a pycnocline. In the Beaufort Sea, the upper layer occupies the 0-50 m level and the pycnocline region is about 200 m thick. The motion of the ice pack is directly affected by the circulating water and by wind stress. For periods of steady drift the ice motion was directed to the right of the wind stress (about 45 deg) shears agreed with observed shears between the surface, 40 m, and 150 m. This is evidence that the motions are in quasi-geostrophic balance. Both in absolute value and phase, the currents at 40 m and 150 m can be explained by a quasi-geostrophic balance associated with a changing surface slope and concomitant adjustments of the internal mass field. The ice motion was governed by a combination of direct wind stress and a sea surface slope, which in turn was established by wind stress and the convergence of the Ekman transport in the upper layer. Ice motion was strongly correlated with the wind field not so much because the ice was directly locally wind-driven, but rather because the sea surface slope caused by convergence in the oceanic Ekman layer was nearly normal to the atmospheric isobars, and therefore also nearly normal to the geostrophic wind field. (Knapp-USGS)
W72-06696

IMAGE ENHANCEMENT TECHNIQUES FOR IMPROVING SEA-ICE DEPICTION IN SATELLITE INFRARED DATA,
Allied Research Associates, Inc., Concord, Mass.
For primary bibliographic entry see Field 07B.
W72-06698

INTERFEROMETRIC STUDY OF FREEZING OF SEA WATER,
Northwestern Univ., Evanston, Ill. Dept. of Mechanical Engineering.
R. Farhadieh, and R. S. Tankin.
Journal of Geophysical Research, Vol 77, No 9, p 1647-1657, March 20, 1972, 10 fig, 12 ref. ONR Contract No 0014-67-A-0356-0021.

Descriptors: *Freezing, *Sea water, *Convection, *Crystallization, *Sea ice, Salinity, Instrumentation, Water temperature, Interferometry, Supercooling.

The role of convection currents in the freezing of sea ice was studied using a Mach-Zehnder interferometer. The isotherms are obtained throughout the liquid and from these the convection pattern can be determined. The temperature distribution in the sea water agrees with the calculations by Veronis that show a reversal of temperature gradient in the central portion of the test sections at large Rayleigh numbers. The ice front that forms in undercooled sea water, where there is a temperature gradient, extends to the 0.0 deg C isotherm. High-salinity brine is ejected by the sea ice at about 80 sec after freezing for the experiments conducted in this study. (Knapp-USGS)
W72-06760

A STUDY OF A MULTIYEAR PRESSURE RIDGE IN THE BEAUFORT SEA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
A. Kovacs, W. F. Weeks, S. Ackley, and W. D. Hibler, III.
AIDJEX Bulletin No 12 (Washington University), p 17-28, February 1972. 7 fig, 12 ref.

Descriptors: *Sea ice, *Topography, *Profiles, Ice cover, Navigation, Ice jams.
Identifiers: *Pressure ridges (Sea ice).

Three transverse profiles were made of a large pressure ridge in the Beaufort Sea. The ridge sail extended 4 m above sea level and the ridge keel extended 13 m below sea level. The cross sections of the ridge keel are roughly semicircular; therefore form drag coefficients for flow transverse to the long axes are high (approximately 1.0). The ice of the ridge is massive. All the interblock voids in the ridge at the time of its formation have been completely filled with ice. Much of the ice in the ridge has a low salinity and is quite strong. Multiyear ridges are significant obstacles to even the largest icebreaking ship and should be avoided if possible. (Knapp-USGS)
W72-06764

VARIATIONS OF EXISTING GLACIERS.

UNESCO-IASH Contribution to the International Hydrological Decade: UNESCO Technical Papers in Hydrology, No 3, 1969. 19 p.

Descriptors: *Glaciers, *Water balance, *Surveys, *International Hydrological Decade, Hydrologic budget, Ice, Temperature, Measurement, Hydrology, Hydrologic cycle, Glaciation, Snowmelt.
Identifiers: Glaciology.

Measurement and compilation of data on variations of existing glaciers provide guidance in observations to obtain as comprehensive a view as possible of the world's glaciers and of their current variations. The variations of glaciers are particularly relevent to the hydrological cycle, for the state of a glacier in relation to its geographical position is an important indicator of climate and the variations of glaciers accordingly provide a measure of climatic trends. The information in this guide is presented under three main headings: (1) Mountain glaciers; (2) Ice sheets, ice caps, and calving glaciers; and (3) Data submission and publication. (Woodard-USGS)
W72-06769

LOW TEMPERATURE TESTS ON LEUPOLD AND STEVENS TYPE A-35 RECORDERS AND RECORDER CLOCKS,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 07B.
W72-06775

PROBABILITY FORECASTS OF WATER SURFACE TEMPERATURES OF THE ST. LAWRENCE RIVER BETWEEN KINGSTON, ONTARIO AND SOREL, QUEBEC,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 04A.
W72-06778

FORMATION OF THE CHEMICAL COMPOSITION OF GROUNDWATERS OF THAWED AREAS WITHIN PERMAFROST IN CENTRAL YAKUTSK ASSR (FORMIROVANIYE KHIMICHESKOGO SOSTAVA PODZEMNYKH VOD TALIKOV NA PRIMERE TSENTRAL'NOY YAKUTII),
Akademiya Nauk SSSR, Moscow. Institut Merzlotovedeniya.
N. P. Anisimova.
Izdatel'stvo 'Nauka', Moscow, 1971. 196 p.

Descriptors: *Water chemistry, *Chemical analysis, *Water quality, *Groundwater, *Permafrost, Hydrogeology, Topography, Geomorphology, Terraces (Geologic), Geochemistry, Geothermal studies, Temperature, Freezing, Thawing, Salts, Ions, Lakes, Springs, Sampling, On-site investigations.
Identifiers: *USSR, *Yakutsk ASSR, *Lena River, *Geocryology, *Thermokarst, Mineralization, Regionalization.

On-site investigations were conducted in 1958-64 in the Lena River region of Central Yakutsk ASSR to study chemical composition of groundwaters of thawed areas within permafrost (taliks) in relation to salt composition of rocks and inflowing waters and to salt accumulation conditions. Waters of underchannel taliks and taliks in the vicinity of slopes were found to possess good water-quality characteristics for drinking-water supply. Special attention was given to the varying chemical composition and mineralization of groundwaters of sublacustrine taliks of Lena River terraces to recommend measures to improve the quality of water to meet potable and agricultural water requirements of small populated centers of the area. To rationally plan exploratory work and utilize water resources of talik zones, the area was divided into 7 regions on the basis of permafrost, geomorphological, and hydrogeological conditions, geological structure, and chemical composition of talik waters. The text is designed for use by glaciologists, hydrogeologists, hydrogeochemists, soil scientists, and geographers. (Josefson-USGS)
W72-06806

ANTARCTIC GLACIOLOGY IN THE INTERNATIONAL HYDROLOGICAL DECADE.

UNESCO-IASH Contribution to the International Hydrological Decade: UNESCO Technical Papers in Hydrology, No 4, 1969. 16 p, 35 ref.

Descriptors: *Glaciers, *Water balance, *International Hydrological Decade, *Antarctic, Surveys, Ice, Precipitation (Atmospheric), Evaporation, Snowmelt, Reviews.
Identifiers: *Glaciology, Ice flow.

The program of the International Hydrological Decade (IHD) provides for the study of snow and ice (including mountain glacier systems) which form significant components of many hydrological systems. This hydrological survey of glaciological research in Antarctica includes the following topics: precipitation, evaporation, melting and snow drift, ice thickness and ice flow. Antarctic precipitation occurs almost completely in the form of ice crystals and in the presence of strong winds. Evaporation and melt losses reach 50 cm/year or more, but in general much smaller quantities are involved. Moreover, any melt water will tend to refreeze in the cold ice below and not contribute to runoff. The measurement of ice thickness in different parts of the ice sheet remains one of the primary tasks of Antarctic expeditions. The seismic spot sounding technique supplemented by measurements of gravity is about to be replaced by radar sounding which can be carried out continuously from an aircraft. The basic flow properties of ice are strongly temperature dependent and there is evidence that they undergo a drastic change especially close to the melting point. (Woodard-USGS)
W72-06917

PHYSICS, CHEMISTRY AND STRUCTURE OF NATURAL ICE AND FROZEN ROCKS (FIZIKA, KHIMIYA I STROYENIYE PRIRODNYKH L'DOV I MERZLYKH GORNYKH POROD),
Moscow State Univ. (USSR).
B. A. Savel'yev.
Izdatel'stvo Moskovskogo Universiteta, 1971. 508 p.

Descriptors: *Ice, *Rocks, *Crystals, *Physicochemical properties, *Structure, Water structure, Water properties, Water chemistry, Aqueous solutions, Ice-water interfaces, Snow cover, Glaciers, Crystallography, Mineralogy, Thermodynamics, Ions, Salts, Gases, Instrumentation, Equipment.
Identifiers: *USSR, *Ice structure, *Ice crystals, *Crystal structure, Crystal lattice, Stereometry, Stereograms.

The chemical physics of ice and frozen rocks is discussed, with emphasis on the properties of ice as they are related to the fine details of its structure. Subjects include: (1) water and ice structure, beginning with study of the water molecule, phase transitions of water, and theory of ice-crystal formation and destruction; (2) interaction of mineral particles and aggregates with water and ice in frozen rock, examined in terms of composition and structural characteristics of the mineral part of frozen rocks, interaction of water and weak aqueous solutions with rocks, and phase composition of water in rocks; (3) structure of various ice formations and methods of studying ice structure; (4) composition of solid, liquid, and gaseous components of ice and migration of matter in ice, as related to ice density and porosity, permeability of snow and firn, and gas composition in ice pores; and (5) structure of frozen rocks, based on examination of water migration processes in liquid and gaseous states in frozen rock and the influence of exchangeable cations on frozen-rock textures and structure of ice inclusions. (Josefson-USGS)
W72-06919

PERMAFROST OF TIEN SHAN (MERZLOTNYYE YAVLENIYA TYAN'-SHANYA),
Kazakhskii Nauchno-Issledovatelski Gidrometeorologicheskii Institut, Alma-Ata (USSR).
A. P. Gorbunov.
Kazakhskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 39, Moskva, 1970. 267 p, 61 fig, 40 tab, 189 ref.

Descriptors: *Permafrost, *Cryogenics, *Cryology, *Frozen ground, *Mountains, Alpine, Climatology, Geology, Geomorphology, Topography, Meteorology, Snow, Ice, Freezing, Thawing, Glacial drift, Mass wasting, Solifluction, Mudflows, Rocks.
Identifiers: *USSR, *Tien Shan, *Central Asia, *Kazakhstan, *Thermokarst topography, Earth hummocks, Block fields, Polygon ground, Ground ice, Ice lenses.

Long-term (1956-68) field investigations were made in the extensive mountain system of Tien Shan, which covers an area of about 350,000 sq km within the USSR. A general description is given of the geology, geomorphology, and climate of the alpine and nival belts of the mountainous country in connection with the presence of perennially frozen ground, which occupies an area of almost 65,000 sq km. Permafrost thickness increases from several meters at an elevation of 3,000 m to 200 m or more at an elevation of 4,000 m. Thawed areas within permafrost (taliks) are extremely common, with transparent taliks observed at elevations of

4,000 m. Cryogenic structure of rocks and ground ice, freeze and thaw rates of the active layer, and changes in permafrost thickness are examined in conjunction with evolution of frozen deposits and effect of permafrost on geomorphology. Data are given on morphology, origin, and distribution of such patterned ground features as earth hummocks and mounds, structural and polygonal soils, solifluction terraces, ice lenses, thermokarst topography, block fields ('stone rivers'), and relict cryogenic formations. Influence of cryogenic processes on formation of alpine mudflows (a rapid flowage type of mass-wasting) is discussed. Plans for economic reclamation of alpine regions of Tien Shan stress the importance of careful evaluation of current permafrost conditions for future construction and mining work in the area. The text is designed for use by hydrogeologists, hydrologists, construction engineers, geomorphologists, geographers, soil scientists, and geologists engaged in working in alpine regions of Central Asia and Kazakhstan. (Josefson-USGS)
W72-06920

HYDROLOGY OF SIBERIAN RIVERS OF THE ARCTIC ZONE (GIDROLOGIYA SIBIRSKIKH REK ARKTICHESKOY ZONY).
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).

Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut Trudy, Vol 290, Antonov, V. S., editor, Leningrad, 1970. 184 p.

Descriptors: *Hydrology, *River systems, *Arctic, *Ice cover, Ice breakup, Ice jams, Meteorology, Snow cover, Stage-discharge relations, Water level fluctuations, Discharge (Water), Runoff, Channels, Deltas, Estuaries, Navigation, Statistical methods, Forecasting, Remote sensing, Instrumentation.
Identifiers: *USSR, *Siberia, *Yenisey River, *Ob River, *Lena River, Ice engineering, Ice control, Ice removal, Anabranches.

Information on the hydrologic regime of major Siberian rivers flowing into arctic seas is provided. Topics include: (1) stage-discharge relations for the 15 largest rivers of the USSR based on flow at the mouth; (2) forecasts of ice breakup dates for the Yenisey, Indigirka, and Kolyma Rivers, based on investigations of the relationship of these dates to atmospheric processes; (3) use of autocorrelation functions for developing long-term forecasts of dates of initial ice occurrence for lower reaches and estuaries of the Ob and Yenisey Rivers; (4) use of aerial reconnaissance to study ice conditions in lower reaches and estuaries of 9 Siberian rivers during ice breakup and freezing; (5) ice-jam formation on the Lena River during high-water years and application of ice-engineering techniques to control and remove ice jams; (6) channel-forming processes in lower delta reaches of the Ob and Yenisey Rivers and measures to improve navigation conditions; and (7) design characteristics of fluid manometers used in water-level gages and analysis of temperature errors. The collection of papers is designed for a wide circle of readers, including methodologists concerned with studying the river regime of large river estuaries; river forecasters and oceanologists; and workers at planning and production agencies associated with operation and development of river systems in Northern Siberia. Studies of the water and ice regime of rivers of the Arctic zone should also prove useful to instructors as well as graduate and undergraduate students interested in various aspects of the problem. (Josefson-USGS)
W72-06921

INVESTIGATION OF ICE REGIME OF RIVERS AND RESERVOIRS (ISSLEDOVANIYE LEDOVOGO REZHIMA REK I VODOKHRANILISHCH).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gidrometeoizdat, Leningrad, Chizhov, A.N., editor, 1971. 152 p.

Descriptors: *Ice cover, *Ice jams, *Ice breakup, *Rivers, *Reservoirs, Hydroelectric plants, Meteorology, Floods, Water levels, Snow, Frazil ice, Freezing, Melting, Ice-water interfaces, Temperature, Heat balance, Thermal stratification, Turnovers, Ice loads, Hydraulics.
Identifiers: *USSR, *Siberia, *Ice structure, *Ice control, Snow ice, Volga River, Dniester River, Dnieper River, Lena River, Benthonic water.

The ice regime of rivers and reservoirs of the USSR is discussed, with emphasis on ice formation and problems of ice control. Titles of the papers are: (1) ice regime of USSR reservoirs; (2) ice-thermal regime of the Kakhovka Reservoir in the zone of construction of the Zaporozh'ye hydroelectric powerplant; (3) temperature regime of Volga River reservoirs during period of complete ice cover; (4) use of electrical modeling to study stresses in ice cover; (5) ice jams and ice-control measures on the Dniester River in the winters of 1967-68 and 1968-69; and (6) the Kyllakh ice jam on the Lena River in 1969. (See W72-06930 thru W72-06935) (Josefson-USGS)
W72-06929

ICE REGIME OF USSR RESERVOIRS (LEDOVYY REZHIM VODOKHRANILISHCH SSSR),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
R. V. Donchenko.
In: Issledovaniye ledovogo rezhima rek i vodokhranilishch, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 187, p 3-108, 1971. 30 fig, 26 tab, 50 ref.

Descriptors: *Ice, *Ice cover, *Temperature, *Freezing, *Reservoirs, Regulation, Air-water interfaces, Ice-water interfaces, Snow, Ice breakup, Ice jams, Frazil ice, Deformation, Meteorology, Heat balance, Heat transfer, Cooling, Melting, Seasonal, Geographical regions.
Identifiers: *USSR, *Siberia, *Volga River, *Dnieper River, *Ice structure, Snow ice.

Investigations were conducted at 25 reservoirs in various geographical regions of the USSR to study occurrence, movement, and structure of ice, heat exchange between water and ice, mixing and cooling of water masses, and rate of ice formation and accretion. Three types of reservoir freezing were identified: (1) rapid freezing at a rate of more than 0.00004 cal/cu cm/sec for 3 days, resulting in an initial ice thickness of 3 cm; (2) normal freezing at a rate of 0.00002-0.00004 cal/cu cm/sec for 3-10 days, producing an initial ice thickness of 15 cm; and (3) slow freezing (accompanied by frazil-ice formation) at a rate of less than 0.00002 cal/cu cm/sec for more than 10 days, resulting in a complete ice cover thicker than 20 cm. Maximum rate of ice accretion on reservoirs was observed during the first month of complete ice cover and ranged from 0.5 to 2 cm/day. Maximum rate of ice accretion for Siberian, Volga River, and Dnieper River reservoirs was 3-5, 5-6, and 4-6 cm/day, respectively. Ice accretion rates decreased in the second half of January and were not more than 0.1 cm/day by the end of February. Reservoir ice reached maximum thicknesses in March: 80-120 cm on Siberian reservoirs; 60-80 cm on Volga River reservoirs; and 40-75 cm on Dnieper River reservoirs. Average rate of reservoir ice melt was 0.2-1.0 cm/day, reaching 3-4 cm/day toward the end of the ice period. Ice thickness on reservoirs varied considerably but was less than that observed on river reaches. Ice breakup of reservoirs lasted 1-49 days as compared with 4-16 days for ice breakup on river reaches. Winter regulation of powerplant operations to conform with rate of ice processes may help alleviate complex ice conditions in tailwater channels of powerplants. (See also W72-06929) (Josefson-USGS)
W72-06930

ICE-THERMAL REGIME OF THE KAKHOVKA RESERVOIR IN THE ZONE OF CONSTRUCTION OF THE ZAPOROZH'YE HYDROELECTRIC POWERPLANT (OSOBENNOSTI LEDOTERMICHESKOGO REZHIMA KAKHOVSKOGO VODOKHRANILISHCHA V ZONE STROITEL'STVA ZAPOROZHSKOY GRES),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. M. Filippov.
In: Issledovaniye ledovogo rezhima rek i vodokhranilishch; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 187, p 109-117, 1971. 5 fig, 5 ref.

Descriptors: *Ice, *Temperature, *Heat balance, *Heat transfer, *Reservoirs, Hydroelectric plants, Discharge (Water), Lake morphometry, Width, Depth, Meteorology, Winds, Wind velocity, Freezing, Cooling, Frazil ice, Winter.
Identifiers: *USSR, *Ukraine, *Zaporozh'ye Oblast, Kakhovka Reservoir.

Characteristics of the ice-thermal regime of the Kakhovka Reservoir (Zaporozh'ye Oblast) in southeast Ukraine and of ice formation in the zone of construction of the Zaporozh'ye hydroelectric powerplant were examined in conjunction with the general character of freezing observed in the 5 morphometrically different zones of the reservoir. Special attention was given to studying the hydrometeorological conditions which determine frazil-ice formation during freezing of the reach on which the water intake of the Zaporozh'ye powerplant was being built. To plan a water intake capable of winter operation, it is necessary to have detailed knowledge of the characteristics and conditions of frazil-ice formation in the construction zone of the powerplant. This calls for additional investigation of all factors responsible for formation of ice on the reservoir reach in question. (See also W72-06929) (Josefson-USGS)
W72-06931

TEMPERATURE REGIME OF VOLGA RIVER RESERVOIRS DURING PERIOD OF COMPLETE ICE COVER (TEMPERATURNYY REZHIM VOLZHSKIKH VODOKHRANILISHCH V PERIOD LEDOSTAVA),
Gosudarstvennyy Gidrologicheskii Institut, Leningrad (USSR).

In: Issledovaniye ledovogo rezhima rek i vodokhranilishch; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 187, p 118-124, 1971. 2 fig, 3 tab, 3 ref.

Descriptors: *Ice cover, *Water temperature, *Thermal stratification, *Reservoirs, Reservoir storage, Lake morphometry, Depth, Mixing, Freezing, Ice breakup, Winter.
Identifiers: *USSR, *Volga River, Rybinsk Reservoir, Gor'kiy Reservoir, Kuybyshev Reservoir, Benthonic water.

Observations were conducted in 1956-65 at the Rybinsk, Gor'kiy, and Kuybyshev Reservoirs on the Volga River to study winter temperature regimes of reservoirs in connection with their morphometric and hydraulic characteristics. Temperature regime of reservoirs under ice cover is generally determined by heat storage in the water and reservoir bed during time of freezing and ice breakup, and by reservoir depth and residence time at winter water temperatures. The Gor'kiy Reservoir has a maximum residence time of 5 million seconds and a minimum storage of 7.8 x 10 to the 9th power/cu m. The Kuybyshev Reservoir has a longer residence time of 9 million seconds and minimum storage of 58.5 x 10 to the 9th power/cu m. The Rybinsk Reservoir, which has a storage of 25.4 x 10 to the 9th power/cu m, has the longest residence time (20 million seconds). Maximum water temperatures are observed at the Rybinsk Reservoir, where average vertical temperature toward the end of the ice period is 1-2 deg C, while average vertical temperature at the Gor'kiy and Kuybyshev Reservoirs are 0.3-0.6 deg C and 0.1-0.2 deg C, respectively. (See also W72-06929) (Josefson-USGS)

W72-06932

USE OF ELECTRICAL MODELING TO STUDY STRESSES IN ICE COVER (ISSLEDOVANIYE NAPRYAZHENNOGO SOSTOYANIYA LEDYANOGO POKROVA METODOM ELEKTRICHESKOGO MODELIROVANIYA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
V. A. Shmatkov.
In: Issledovaniye ledovogo rezhima rek i vodokhranilishch; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 187, p 125-131, 1971. 4 fig, 3 tab, 3 ref.

Descriptors: *Ice cover, *Stress, *Stress analysis, *Electrical studies, *Analog models, Viscosity, Viscous flow, Stokes law, Elasticity (Mechanical), Loads (Forces), Ice loads, Winds, Hydraulic structures, Hydraulics.
Identifiers: *USSR, Gulf of Finland.

An electric model was developed for calculating stresses in ice cover exposed to loads developed on its surface by wind and current. The electric model was designed for a reach of ice anchored at the eastern end of the Gulf of Finland and extending out into open water. Viscous flow was found to occur after the stresses in ice exceeded the elastic limit assumed to equal 5 metric tons/sq m. The model described provides a graphic picture of stress distribution in ice cover of the water body examined. Modeling can be successfully applied to general assessment of stresses in ice cover of a water body in the vicinity of hydraulic construction and should precede direct instrument measurements and determinations of ice loads that may be exerted against hydraulic structures. (See also W72-06929) (Josefson-USGS)
W72-06933

ICE JAMS AND ICE-CONTROL MEASURES ON THE DNIESTER RIVER IN THE WINTERS OF 1967-68 AND 1968-69 (ZATORY L'DA NA R. DNESTRE V ZIMY 1967-68 I 1968-69 GG. I MEROPRIYATIYA PO BOR'BE S NIMI),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
V. N. Karnovich.
In: Issledovaniye ledovogo rezhima rek i vodokhranilishch; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 187, p 132-144, 1971. 4 fig, 1 tab, 6 ref.

Descriptors: *Ice, *Ice jams, *Ice breakup, Floods, Water levels, Discharge (Water), Rivers, Reservoirs, Rain, Thawing, Air temperature, Winter, Spring, On-site investigations.
Identifiers: *USSR, *Moldavia, *Dniester River, Dubossary Reservoir, Ice control.

On-site investigations of ice jams on the Dniester River and Dubossary Reservoir were conducted by the Moldavian Hydrometeorological Service Administration in the winters of 1967-68 and 1968-69, and by the author in the spring of 1969 to examine the effectiveness of measures undertaken during these winter periods to control ice jams. Two periods of winter ice breakup accompanied by ice-jam formations were observed on the Dniester River and in the channel reach of the reservoir of the Dubossary hydroelectric powerplant in the two winter seasons examined. Ice jams on the Dniester River must be controlled during winter months, since conditions favoring formation of severe ice jams in spring very often originate during periods of winter ice breakup. Since winter ice jams on the Dniester become unstable toward spring, measures must be undertaken to open the channel or to eliminate these ice jams during periods of initial jamming. Regulation of discharges of the Dubossary hydroelectric powerplant will help control ice-jam formation and its effects. (See also W72-06929) (Josefson-USGS)
W72-06934

KYLLAKH ICE JAM ON THE LENA RIVER IN 1969 (KYLLAKHSKIY ZATOR L'DA NA R. LENE V 1969 G.),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. S. Rudnev.
In: Issledovaniye ledovogo rezhima rek i vodokhranilishch; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 187, p 145-149, 1971. 1 fig, 1 ref.

Descriptors: *Ice, *Ice jams, *Ice breakup, *Rivers, *Floods, Historic floods, Water levels, Spring, Winter.
Identifiers: *USSR, *Yakutsk ASSR, *Lena River, Lake Kyllakh.

The ice jam formed on the Lena River in the region of Lake Kyllakh (Yakutsk ASSR) was not only the thickest observed on the river in the spring of 1969 but was the thickest ever recalled by the inhabitants of the Olekminsk Rayon in the last 54 years. The severe winter and late, cold spring of 1969 produced an ice cover on the river reach 0.5 m thicker than average, with ice thicknesses of 159 cm recorded at Olekminsk and 132 cm at Macha. Late spring in the river basin delayed breakup of ice on the river in the region of Macha and Olekminsk until May 24, 6-8 days later than usual. Formation of the ice jam in the vicinity of Lake Kyllakh resulted in flooding of a number of populated centers on the Lena River floodplain, similar to the flooding which occurred in the same area in 1914 and 1915. The 1969 water level was practically as high as the 1915 level in the vicinity of Neryuktey 1, about 2 m higher than the 1915 level in the vicinity of Biryuk, and 3.3 m lower than the 1915 level in the region of Kochegarovo. (See also W72-06929) (Josefson-USGS)
W72-06935

CALIBRATING THE SNOW PARTICLE COUNTER FOR PARTICLE SIZE AND SPEED,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
R. A. Schmidt, and E. W. Holub.
USDA Forest Service Research Note RM-189, 1971, 8 p, 8 fig.

Descriptors: *Snow, Crystals, *Particle size, Instrumentation, Calibrations, Snowpacks, Sampling.
Identifiers: *Particle speed, *Snow crystals, Particle counter.

Laboratory calibration of a photoelectric snow particle counter shows the device gives useful estimates of particle speed and size without large temperature corrections, although some field adjustments are necessary for optimum performance.
W72-07067

2D. Evaporation and Transpiration

COOLING OF A WATER SURFACE BY EVAPORATION, RADIATION, AND HEAT TRANSFER,
Oregon State Univ., Corvallis. Dept. of Oceanography.
C. A. Paulson, and T. W. Parker.
Journal of Geophysical Research, Vol 77, No 3, p 491-495, January 20, 1972. 1 fig, 2 tab, 11 ref. NSF Grant GA1099; ONR Contract N00014-67-A-0369-0007.

Descriptors: *Heat transfer, *Sea water, *Evaporation, *Radiation, *Cooling, Heat budget, Solar radiation, Convection, Diffusion, Air-water interfaces.

The sea surface temperature is usually cooler than the water immediately below. This temperature difference occurs because the upward heat flux in the water just below the interface is most often positive. The temperature difference between a water surface and 10-cm depth was examined in the laboratory as a function of surface stress and heat transfer just below the interface. The experiments support the existence of a hypothetical layer immediately below the interface in which the vertical transfer of heat and momentum is primarily by molecular processes. (Knapp-USGS)
W72-06700

VARIATION OF ALBEDO OF SELECTED SAGEBRUSH RANGE IN THE INTERMOUNTAIN REGION,
Utah State Univ., Logan. Dept. of Solids and Meteorology; and Idaho Univ., Moscow. Coll. of Forestry.
For primary bibliographic entry see Field 02I.
W72-06706

EVALUATION OF LATENT EVAPORATION ESTIMATES AND THEIR CONVERSION TO POTENTIAL EVAPORATION,
Department of Agriculture, Ottawa (Ontario). Plant Research Inst.
W. Baier.
Can J Plant Sci. 51 (4): 255-266. 1971. Illus.
Identifiers: Conversion, Crop, Development, Evaporation, Latent, Potential.

Daily and monthly latent evaporation (LE) estimates obtained from an earlier-described regression-type model are compared with estimates from Penman's (PE) and Thornthwaite's (PET) techniques. Penman's PE was selected as a control. Daily PE estimates were more closely related to LE than to PET estimates, as seen from the coefficients of determination (100 CD) of 52 and 21%, respectively. Similarly, variations of monthly PE means were more closely associated with variations of monthly LE means (65%) than with PET means (45%). Both the LE and PET models use the same standard climatic data as input. The improvement of 31% for the daily values and 20% for the monthly means results from using maximum and minium air temperatures separately in the LE model, instead of mean air temperature as in the PET technique. The least bias in PE as derived from converted LE estimates was obtained by a factor of 0.0094 cm/cm3 (0.0037 in./cm3). However, a review of literature on ratios of consumptive water use by irrigated crops to LE measurements suggested a factor in the order of 0.086 cm/cm3 (0.0034 in./cm3). This factor has been successfully employed in irrigation scheduling and water budgeting experiments. The discrepancy could result from the consumptive crop water use for part of the growing season being less than Penman's PE as computed in this study. Although eventually seasonly adjusted conversion factors based on crop development phases are preferred, the findings warrant the use of the LE model in various climates for estimating either PE, by applying 0.0094 cm/cm3 (0.0037 in./cm3), or seasonal consumptive crop water use, by applying 0.0086 cm/cm3 (0.0034 in./cm3).--Copyright 1971, Biological Abstracts, Inc.
W72-06716

EVAPORATION IN SHELTERED AREAS AS INFLUENCED BY WINDBREAK POROSITY,
Agricultural Research Service, Manhattan, Kans. Soil and Water Conservation Research Div.
E. L. Skidmore, and L. J. Hagen.
Agricultural Meteorology, Vol 7, p 363-373, 1970. 7 fig, 1 tab, 22 ref.

Descriptors: *Evaporation, *Evaporation control, *Windbreaks, *Data collections, *Atmometers, Measurement, Analytical techniques, Winds, Velocity, Barriers, Porosity, Height, Water conservation, Soil conservation, Testing.
Identifiers: *Evaporation rates.

Evaporation was measured with atmometers located from 6H (H is height in feet of windbreak) windward (upwind) to 12 H leeward (downwind) of an 8 ft. high windbreak. Evaporation, wind speed, and other associated micrometeorological measurements were made when the wind direction

was perpendicular plus or minus 25 deg to the windbreak. With less porous windbreaks, minimum leeward evaporation occurred closer to the windbreak and, after reaching minimum, tended to increase more quickly than with more porous windbreaks. Minimum evaporation leeward of the 60%, 40%, and 0% porous windbreaks occurred at about 4.5 H, 3.5 H, and immediately adjacent to the windbreak, respectively. At 4 H leeward of the solid windbreak, evaporation had recovered to 92% of open-field evaporation, whereas at 4 H leeward of 40% and 60% porous windbreaks, evaporation rates were 65% and 75% of open-field evaporation, respectively. Lowest relative evaporation over the observation region from 6 H windward to 12 H leeward was achieved with a 40% porous barrier. The windbreaks reduced evaporation in proportion to wind speed reduction. Data from measuring evaporation with atmometers agreed fairly well with data calculated with a revised combination model for instantaneous potential evaporation rate. (Woodard-USGS)
W72-06796

EVAPOTRANSPIRATION FROM A SMALL CLAY CATCHMENT,
R. K. Pegg, and R. C. Ward.
Journal of Hydrology, Vol 15, No 2, p 149-165, February 1972. 4 fig, 6 tab, 36 ref.

Descriptors: *Evapotranspiration, *Water balance, Lysimeters, Evaporation pans, Evaporimeters, Till, Clays, Soil properties, Glacial soils.
Identifiers: *England.

In a small, carefully instrumented research catchment it should be possible to solve the water balance equation for various time periods. Using this approach evapotranspiration losses from a boulder-clay catchment in Eastern England were calculated from the water balance equation. The results were compared with a number of standard methods of measuring and estimating evapotranspiration, e.g. evaporation pans, evapotranspirometers, standard formulae. When evapotranspiration occurs at or near the potential rate, a simple evapotranspirometer and the Penman formula give the most satisfactory results. During the limited periods when actual evapotranspiration falls substantially below the potential rate, none of the methods were particularly satisfactory. (Knapp-USGS)
W72-06799

MEASUREMENT OF PLANT COMMUNITY COVER FROM AERIAL PHOTOGRAPHS USING EKTACHROME INFRARED AERO FILM,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 07B.
W72-07006

DROUGHT RELATIONSHIPS AND DISTRIBUTION OF TWO MEDITERRANEAN-CLIMATE CALIFORNIA PLANT COMMUNITIES,
Stanford Univ., Calif. Dept. of Biological Sciences.
For primary bibliographic entry see Field 02I.
W72-07047

SIMULTANEOUS MEASUREMENTS OF SOLUTION ABSORPTION, TRANSPIRATION, RELATIVE PLANT WATER CONTENT AND GROWTH,
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
For primary bibliographic entry see Field 02I.
W72-07052

ENERGY BALANCE AND WATER USE OF RICE GROWN IN THE CENTRAL VALLEY OF CALIFORNIA,
California Univ., Davis. Dept. of Water Science and Engineering.
F. J. Lourence, and W. O. Pruitt.
Agronomy Journal, Vol 63, No 6, p 827-832, November-December 1971. 6 fig, 3 tab, 23 ref.

Descriptors: *Evapotranspiration, *Lysimeters, *Rice, *Crop response, *Microclimatology, Temperature, California, Humidity, Microenvironment, Solar radiation, Air temperature, Environmental effects, Winds, Advection, Estimating equations, Grasses, Arid lands.
Identifiers: *Bowen ratio, *Potential evapotranspiration.

Very little basic work has been done in the U.S. on the energy balance of a growing rice crop. Much needs to be done in evaluating the effects of irrigation water temperature and amount on rice yields and the effects of climatic variations on water utilization by rice. Using measured data for soil heat flux, air temperature, net solar radiation and relative humidity, evapotranspiration was calculated using the Bowen ratio energy-balance method, and compared with values measured in a weighing lysimeter 25 mi away in Davis, California. The estimated value for a normal season of use was 920 mm. This value was only 3.5% greater than the 10-year mean used by a grass, Fescue eliator, at Davis. Because of lack of advection at the rice-growing site, humidities over the crop were higher and wind speeds were lower than at Davis, confirming the importance of the humidity as a microclimatic effect on crop evapotranspiration. It was estimated that if the crop had been grown at Davis in the region of the lysimeter, the rice water consumption would have been 20-25% greater than that of the grass. (Casey-Arizona)
W72-07057

ECONOMICAL CONVERSION OF A MINIATURE NET RADIOMETER TO AN ALL-WAVE HEMISPHERIC RADIOMETER,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
James M. Brown.
USDA Forest Serv. Res. Note NC-123, 1971, 2 p, 1 fig, 2 ref.

Descriptors: *Equipment, *Instrumentation, *Meteorology, *Energy, *Solar radiation, Thermal radiation, Infrared radiation, Irradiation.
Identifiers: *Radiometer, *Net radiometer, *All-wave hemispheric radiometer, Pyrradiometer.

A conversion that permits miniature net radiometers to be utilized as all-wave hemispheric radiometers (pyrradiometers) is described. The conversion is simple, inexpensive, and does not preclude the original use of the instrument.
W72-07072

AN INSULATED EVAPORIMETER,
Forest Service (USDA), Logan, Utah, Intermountain Forest and Range Experiment Station.
Bruce P. Van Haveren, and Eugene E. Farmer.
Water Resources Bulletin, Vol 7, No 6, p. 1250-1252, December 1971.

Descriptors: *Evaporation, *Evaporation pans, *Environmental effects, Air temperature, Winds, Solar radiation, Energy budget, Water properties, Ice, Temperature, Equipment.
Identifiers: Insulated evaporation pan, Evaporation equipment.

Evaporation was measured from a circular evaporation pan, 18 inches in diameter and 8 inches deep. The pan was insulated on the sides and bottom with two inches of freon-blown polyurethane foam. A U.S. Weather Bureau class 'A' evaporation pan was used to obtain reference evaporation measurements. Water evaporation from the class 'A' pan and the insulated pan is highly correlated. Through the use of a water-methanol mixture, the insulated pan may be operated at temperatures below 32 F; the equivalent liquid water evaporation may be determined through a regression equation.
W72-07076

INFLUENCE OF SOIL PROPERTIES AND CULTURAL PRACTICES ON EVAPORATION OF WATER FROM SOIL,
Clemson Univ., S. C. Water Resources Research Inst.
T. C. Peele.
Available from the National Technical Information Service as PB-208 412, $3.00 in paper copy, $0.95 in microfiche. South Carolina Water Resources Institute, Clemson, Report No. 28, March 1972. 23 p, 7 fig, 9 tab, 24 ref. OWRR A-015-SC (1).

Descriptors: *Evaporation, *Transpiration, *Soil moisture, *Soil texture, *Mulching, Soil properties, Water loss, Soil water movement, Soil surfaces, Cotton, Cultivation, Oats.
Identifiers: Oats straw mulch.

Moisture loss from outdoor tanks of soils which could be protected from rainfall was measured by weight loss. Evaporation accounted for 79% of water loss and transpiration 21% where cotton plants were grown to a height of 10 inches. With bare soil, evaporation was higher from the finer textured soils with the evaporation rates decreasing as the percent sand increased. Placing the B horizon over the A horizon increased evaporation. Mulches of oats straw at the rates of 1, 2, and 3 tons per acre (dry weight) reduced evaporation 33%, 63%, and 80% respectively compared with bare soil.
W72-07128

THE SOIL-PLANT-ATMOSPHERE CONTINUUM IN THE HYDROLOGICAL CYCLE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 02A.
W72-07235

2E. Streamflow and Runoff

A SHORT NOTE ON THE SPEED CALIBRATION OF THE GEODYNE MODEL 920 CURRENT METER,
For primary bibliographic entry see Field 07B.
W72-06684

THE NIAGARA RIVER PLUME. PART I. TEMPERATURE AND CURRENT STRUCTURE IN THE NIAGARA RIVER PLUME. PART II. THE MIXING OF THE NIAGARA RIVER PLUME IN LAKE ONTARIO,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 02H.
W72-06685

WATER STRESS AND OCEAN CURRENT MEASUREMENTS AT CAMP 200,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 02C.
W72-06695

WATER AND ICE MOTION IN THE BEAUFORT SEA, SPRING 1970,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 02C.
W72-06696

INSTRUMENTATION AND MEASURING TECHNIQUES,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 02J.
W72-06761

SUSPENDED LOAD,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 02J.
W72-06762

APPRAISAL OF STREAMFLOW IN THE TUALATIN RIVER BASIN, WASHINGTON COUNTY, OREGON,
Geological Survey, Portland, Oreg.
C. H. Swift, III.
Geological Survey Open-file Report, 1972. 38 p, 13 fig, 10 tab, 24 ref.

Descriptors: *Streamflow, *Flow rates, *Annual, *Water storage, *Statistical methods, Average flow, Low flow, Peak discharge, Planning water resources development, Hydrographs, Input-output analysis, Hydrologic data, Stream gages, Streamflow forecasting, Distribution patterns.
Identifiers: *Washington County (Oreg).

The within-year time distribution of streamflow is described. Also discussed are the magnitude and frequency of annual minimum, mean, and maximum flows, and the with-in year storage required to sustain selected flows in the Tualatin River basin in Washington County, Oregon. Data were derived by statistical methods and are adequate for general water-development planning. A duration hydrograph provides a general description of the with-in year time distribution of streamflow. Generalized equations based on a sample of gaged flows are presented for estimating magnitude and frequency of flows at ungaged sites. Generalized storage relations are included for estimating storage requirements at gaged and ungaged sites. (Woodard-USGS)
W72-06771

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1970,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W72-06774

LOW TEMPERATURE TESTS ON LEUPOLD AND STEVENS TYPE A-35 RECORDERS AND RECORDER CLOCKS,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 07B.
W72-06775

HULBURT CREEK HYDROLOGY, SOUTHWESTERN WISCONSIN,
Geological Survey, Madison, Wis.
W. A. Gebert.
Geological Survey Open-file Report, 1971. 11 p, 3 fig, 2 tab, 6 ref.

Descriptors: *Streamflow, *Rainfall-runoff relationships, *Reservoir design, *Small watersheds, *Wisconsin, Hydrologic data, Data collections, Floods, Hydrology, Flood forecasting, Steam gages, Flow measurement.
Identifiers: *Hulburt Creek, Sauk County (Wis).

Hydrologic characteristics were determined for Hulburt Creek, Sauk County, Wisconsin (drainage area 11.2 sq mi), in order to evaluate a proposed reservoir. The low-flow values determined are 2.6 cfs for the annual minimum 7-day mean flow that occurs on the average of once in 2 years and 2.1 cfs for the annual minimum 7-day mean flow that occurs on the average of once in 10 years. The 30 months it should take to fill the proposed 8,070 acre-foot Dell Lake Reservoir was estimated from the monthly flows of Hulburt Creek determined for the 1958-65 period. The probable maximum precipitation of 24 inches in 6 hours would cause the probable maximum flood in the Hulburt Creek area. (Woodard-USGS)
W72-06789

WATER RECORDS OF PUERTO RICO, 1964-67: VOLUME 2--SOUTH AND WEST SLOPES,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 07C.
W72-06798

MATHEMATICAL PROPERTIES OF THE KINEMATIC CASCADE,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 02A.
W72-06800

HYDROLOGIC COMPUTATIONS (GIDROLOGICHESKIYE RASCHETY),
For primary bibliographic entry see Field 02A.
W72-06802

LONG-TERM RUNOFF FLUCTUATIONS OF THE VOLGA RIVER (MNOGOLETNIYE KOLEBANIYA STOKA VOLGI),
E. I. Sarukhanyan, and N. P. Smirnov.
Gidrometeoizdat, Leningrad, 1971. 168 p.

Descriptors: *Runoff, *Cycles, *Fluctuations, *Variability, *Rivers, River basins, Geophysics, Climatology, Meteorology, Atlantic Ocean, Air circulation, Atmospheric pressure, Solar radiation, Tides, Discharge (Water), Runoff forecasting, Streamflow forecasting, Probability, Time series analysis, Seasonal.
Identifiers: *USSR, *Volga River, Coefficient of correlation, Spectrograms.

This monograph examines long-term fluctuations of runoff on the upper, middle, and lower reaches of the Volga River. Results of investigations of 2-3, 5-7, 10-11, 14-15, and 18-20-year cycle runoff fluctuations, based on time series analysis, are examined in terms of the relationship of these fluctuations to corresponding changes in atmospheric circulation in the North Atlantic. The relationship of long-term fluctuations of Volga River runoff to such meteorological and geophysical factors as lunar tides, solar activity, and movement of the earth's poles is analyzed to develop techniques for extended forecasts of long-term runoff fluctuations. Of particular interest to hydrologists, the book will also be an invaluable aid for graduate and undergraduate students of hydrometeorological institutes and universities and for those interested in studying climatic fluctuations and climatic factors affecting runoff. (Josefson-USGS)
W72-06805

ARON V. CITY OF PHILADELPHIA (INADEQUACY OF MUNICIPAL SEWER IN EXCEPTIONAL INSTANCES).
For primary bibliographic entry see Field 06E.
W72-06896

HYDROLOGY OF TWO SMALL RIVER BASINS IN PENNSYLVANIA BEFORE URBANIZATION,
Geological Survey, Washington, D.C.
R. A. Miller, J. Troxell, and L. B. Leopold.
Available GPO, Washington, DC 20402 $0.75 (paper cover) Stock No. 2401-1145. Geological Survey Professional Paper 701-A, 1971. 57 p, 20 fig, 11 tab, 19 ref.

Descriptors: *Urbanization, *Pennsylvania, *Hydrologic data, *Data collections, Rainfall-runoff relationships, Land use, Water yield, Sediment yield, Water quality, Small watersheds.
Identifiers: *Urban hydrology.

Basic data on water quality, chemical quality, and suspended sediment are tabulated to record the conditions existing in two basins near Philadelphia, each about 32 square miles in area. The basins in 1970 are agricultural land for the most part, but urban and industrial development is imminent as the Philadelphia metropolitan area expands. As changes caused by urbanization occur in future years, the data will be useful as a base for comparison. Pickering Creek basin has a higher population than the upper East Branch Brandywine Creek basin. The two are comparable in discharge characteristics and in shapes and sizes of channels, but the Pickering Creek basin is producing a considerably larger suspended-sediment load. Also the effects of urbanization are discernible in some chemical parameters. During the study, a small subbasin, one-half square mile in area, was converted from agricultural use to an industrial park. This change resulted in a marked increase in sulfates, nitrates, chlorides, and dissolved solids in the streamflow. (Knapp-USGS)
W72-06912

CHANNEL MOVEMENT OF MEANDERING INDIANA STREAMS,
Geological Survey, Washington, D.C.
J. F. Daniel.
Available GPO, Washington, DC 20402-$0.35, Stock No 2402-1221. Geological Survey Professional Paper 732-A, 1971. 20 fig, 2 tab, 23 ref.

Descriptors: *Channel morphology, *Channel flow, *Meanders, *Channel erosion, *Indiana, Analytical techniques, Correlation analysis.
Identifiers: *Channel movement, *Path-length increase, Meandering streams.

The process of channel movement in a meander system involves rotation and translation of meander loops and an increasing path length. The amount of path-length increase is directly proportional to the impulse supplied by discharge and is inversely proportional to the silt-clay percentage of the material composing the channel perimeter. Of six field sites investigated in Indiana streams, three meander systems had path-length increases of sufficient magnitude to correlate with above-average discharge volume. One system had no discernible change over a 30-year period, and two systems had changes which were too small for correlation because of the short period of data collections. A general relation was developed between path-length increase per thousand cubic-feet-per-second-days per square mile of drainage area above average discharge and the width-depth ratio of the channel. (Woodard-USGS)
W72-06913

WATER RESOURCES OF THE UPPER WHITE RIVER BASIN, EAST-CENTRAL INDIANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W72-06999

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 1.--NORTH ATLANTIC SLOPE BASINS.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-07011

INDEX TO SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 3.--OHIO RIVER BASIN.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-07012

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 5--HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-07013

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 11.--PACIFIC SLOPE BASINS IN CALIFORNIA.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-07014

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 12. PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-07015

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 13. SNAKE RIVER BASIN.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-07016

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 14. PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-07017

SUPERCRITICAL FLOW OVER SILLS,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W72-07018

SIMULATION OF LONG WAVES IN BRANCHING WATERWAYS,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
R. F. Henry.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 98, No HY4, Paper 8831, 609-629, April 1972. 13 fig, 5 ref, append.

Descriptors: *Simulation analysis, *Tidal effects, *Bores, *Waves (Water), *Tsunamis, Rivers, Water level fluctuations, Synthetic hydrology, Model studies, Computer programs, Numerical analysis, Estuaries.

Problems of tidal motion in rivers and estuaries and tsunami response of coastal inlets are long wave phenomena governed by hyperbolic equations. Economical simulation of a large system requires efficient solution of the difference equation at each time step. If the river is first divided into a number of overlapping segments, each of which covers one bifurcation, confluence, or other changes, the simulation program can be built up quickly by repeated use of a few standard subroutes, one describing a bifurcation, one a confluence, and so on. At every step, each segment is solved separately by the appropriate subroutine and then the solutions are pieced together to give the updated solution for the whole river. For digital simulation, the system is divided into overlapping segments and the motion is computed for each segment separately over a time increment short enough to ensure that errors due to neglect of neighboring segments are confined to the regions of overlap. The solution for the whole system at the end of each time increment is found by discarding erroneous portions of the solutions for the various segments and piecing together the remaining parts. The difficulties of programing a single large difference scheme to cover a whole inlet or river are avoided and the problem is reduced to linking standard subroutines representing commonly-encountered feastures such as bifurcations and confluences. A numerical experiment was performed to test the method in a known physical situation and to compare various methods of linking adjacent segments. (Knapp-USGS)
W72-07019

BIBLIOGRAPHY OF U.S. GEOLOGICAL SURVEY WATER-RESOURCES REPORTS FOR UTAH.
Geological Survey, Salt Lake City, Utah.

Utah Department of Natural Resources Information Bulletin No 22, 1972. 53 p, 4 tab.

Descriptors: *Bibliographies, *Water resources, *Documentation, *Publications, *Utah, Hydrology, Surface waters, Groundwater, Geology, Hydrogeology, Water quality, Water analysis, Water yield, Water levels, Streamflow, Gaging stations, Hydrologic cycle, Water demand, Water users, Water resources development.

This bibliography contains a complete listing to December 31, 1971, of reports relating to the water resources of Utah prepared by personnel of the U.S. Geological Survey. Related subjects include geology, hydrology, and chemical quality of the water. The reports were, for the most part, prepared by personnel assigned to the Water Resources Division, Utah District, in cooperation with State and local agencies. The bibliography is divided into four major parts: (1) publications of the Geological Survey; (2) publications by agencies of the State of Utah; (3) other publications--reports prepared by Survey personnel, but published by other agencies or by professional organizations in their journals; and (4) open-file reports of the Geological Survey. (Woodard-USGS)
W72-07026

WATER RESOURCES OF BIG SMOKY VALLEY, LANDER, NYE, AND ESMERALDA COUNTIES, NEVADA,
Geological Survey, Carson City, Nev.
F. E. Rush, and C. V. Schroer.
Nevada Division of Water Resources Bulletin No 41, 1971. 84 p, 17 fig, 2 plate, 32 tab, 62 ref.

Descriptors: *Water resources, *Groundwater, *Hydrogeology, *Nevada, Aquifer characteristics, Alluvium, Groundwater movement, Water yield, Groundwater recharge, Precipitation (Atmospheric), Hydrologic data, Water supply, Water users, Water wells, Runoff, Hydrologic budget, Water resources development, Surface-groundwater relationships.
Identifiers: *Big Smoky Valley (Nev).

Big Smoky Valley has an area of 2,926 square miles and lies near the center of Nevada. The valley-fill reservoirs have a maximum thickness of between 3,000 and 5,000 feet. The estimated groundwater stored in the upper 100 feet of saturated alluvium is 5,000,000 and 7,000,000 acre-feet, for the northern part of the valley and Tonopah Flat, respectively. Transmissivity of the valley fill is less than 50,000 gpd per foot, except in the area between Round Mountain and San Antonio Ranch, where it is more than 100,000 gpd per foot. In most areas, the groundwater is under water-table conditions. The storage coefficient averaged about 0.15 for the valley-fill reservoirs. The depth to groundwater is generally less than 100 feet. Average annual precipitation ranges from as much as 20 inches in the high mountains to 4 to 7 inches on the valley floor. The estimated perennial yields of the valley-fill reservoirs are 65,000 acre-feet and 6,000 acre-feet for the northern part of the valley and Tonopah Flat, respectively. (Woodard-USGS)
W72-07030

SYSTEM FOR MEASURING AND COMPUTING EPHEMERAL RUNOFF FROM SMALL WATERSHEDS,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
P. D. Duffy, and T. R. Dell.
U. S. Forest Serv. Res. Note SO-138, 1972. 4 p, 7 ref.

Descriptors: *Instrumentation, *Computer programs, *Ephemeral streams, *Runoff, *Automation, *Data processing, Discharge measurement, Equipment, Gaging stations, Small watersheds, Hydrographs, Flumes, Translations, Digital computers, Mississippi.
Identifiers: *Experimental watersheds, Analog-to-digital recorders.

The system described records runoff data on tape at 2-minute intervals, translates from tape to data cards, and computes information about runoff by storm and by day, month, and year. Hydrographs can be readily constructed from the summaries provided. Equipment includes H-flumes, analog-to-digital recorders (ADR), an ADR tape translator, and a digital computer.
W72-07082

A COMPUTER PROGRAM FOR COMPUTING STREAMFLOW VOLUMES,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
P. A. Ingebo, W. B. Casner, and G. L. Godsey.
USDA Forest Serv. Res. Note RM 203, 1971. 8 p, 4 fig, 1 tab, 1 ref.

Descriptors: *Water measurement, *Discharge measurement, *Flow measurement, *Computer programs, *Data processing, Measurement, Stream gages, Flow rates, Streamflow, Computers, Hydraulics.
Identifiers: *Computing streamflow, Programming.

A program for use with a digital computer to compute streamflow volumes is described. Computations are based on tabulations of gage heights prepared from continuous stream-gage records. Any of several formulas or rating tables may be selected for each water year's computations. Elements of flow show in a sequence printout of daily volumes. An annual volume summary, tabulated by day and month, may be printed in one or more different units.
W72-07083

ECONOMETRIC MODEL FOR RIVER BASIN PLANNING,
For primary bibliographic entry see Field 04A.
W72-07110

FORECASTING WATER-LEVELS OF THE ORINOCO RIVER IN VENEZUELA,
For primary bibliographic entry see Field 02A.
W72-07240

APPLICATIONS OF DISCHARGE AND WATER-LEVEL FORECASTS,
Comite National Francaise de Geodesie et Geophysique, Rueil-Malmaison. Section d'-Hydrologie Scientifique.
For primary bibliographic entry see Field 02A.
W72-07241

THE OPERATION OF SOMERSET DAM--A MULTI-PURPOSE PROJECT (AUSTRALIA),
Water Supply Design Office, Brisbane (Australia).
For primary bibliographic entry see Field 02A.
W72-07243

2F. Groundwater

ELECTRICAL AND SEISMIC PROPERTIES OF THE EARTH'S CRUST IN THE SOUTHWESTERN GREAT PLAINS OF THE U.S.A.,
Texas Univ., Dallas.
B. J. Mitchell, and M. Landisman.
Geophysics, Vol 36, No 2, p 363-381, April 1971. 8 fig, 1 tab, 39 ref.

Descriptors: *Resistivity, *Geophysics, *Seismic properties, *Deep water, *Subsurface mapping, Model studies, Magnetic studies, Texas, New

Mexico, Great Plains, Temperature, Data processing, Networks.
Identifiers: *Magnetotelluronic studies, *Crustal studies, *Interstitial water (Geology).

Electrical resistivity determinations throughout the world have indicated that there is a region of low resistivity in the upper or middle part of the Earth's crust. Crustal low-velocity zones have been found at depths similar to those of the low resistivity zones. The question has immediately arisen as to whether zones of low resistivity coincide with zones of low velocity within the Earth's crust, and if so, what physical mechanism determines the boundaries of those zones. At present, there are only 3 regions in the world where these 2 crustal properties might be correlated: Southern Africa, the Massif central area of France and the Ukrainian shield. This study presents a resistivity model of the crust for a region of west Texas north of Lubbock, using data from a network of 20 magnetotelluronic stations. A seismic velocity model of eastern New Mexico allowed correlation of electric and seismic properties in the southwestern Great Plains region. A computer-derived model includes an anisotropic low resistivity layer at depths slightly greater than 20 km. Comparison with the seismic velocity interpretation for New Mexico indicates the low velocity and low-resistivity layers coincide. The low resistivity values are interpreted as resulting from an interstitial fluid which may also cause the low velocities and form a weak region in which continental earthquakes occur. Interstitial water at depth in the crust is discussed. (Casey-Arizona)
W72-06730

GEOHYDROLOGY OF PROJECT GNOME SITE, EDDY COUNTY, NEW MEXICO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08H.
W72-06784

HYDROGEOLOGIC DATA FOR THE UPPER CONNECTICUT RIVER BASIN, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 04B.
W72-06792

FORMATION OF THE CHEMICAL COMPOSITION OF GROUNDWATERS OF THAWED AREAS WITHIN PERMAFROST IN CENTRAL YAKUTSK ASSR (FORMIROVANIYE KHIMICHESKOGO SOSTAVA PODZEMNYKH VOD TALIKOV NA PRIMERE TSENTRAL'NOY YAKUTII),
Akademiya Nauk SSSR, Moscow. Institut Merzlotovedeniya.
For primary bibliographic entry see Field 02C.
W72-06806

WATER BALANCE STUDY OF THE GROUND WATER ON THE LOWER PART OF THE RIVER FUJI,
Tokyo Univ. of Education (Japan). Geographical Inst.; and Tokyo Univ. of Education (Japan). Geological and Mineralogical Inst.
S. Yamamoto.
Tokyo Kyoiku Daigaku Science Reports, Section C, Geography, Geology and Mineralogy, Vol 10, No 101-102, p 253-276, March 25, 1971. 13 fig, 3 tab, 2 ref.

Descriptors: *Groundwater recharge, *Surface-groundwater relationships, *Water wells, *Hydrologic data, Foreign countries, Aquifers, Water yield, Observation wells, Data collections, Water users, Water demand, Model studies, Input-output analysis.
Identifiers: *River Fuji (Japan).

Surface-groundwater relationships were studied concerning groundwater recharge along the River Fuji in Japan. The investigated area is one part of a fan-like deltaic plain extending eastward from Iwamoto to Suruga Bay coast and bound on the west and north by Iwabuti Hill of Tertiary agglomeratic rocks. Connecting this Hill is a lower (Holocene) river terrace. Mean annual precipitation at Fuji is about 2,100/mm. Most of the wells are for industrial use of municipal water supply with a depth of 50 to 100 m. The daily amount of discharge from 21 observation wells is tabulated. The monthly total discharge from one of the wells in 1965 ranged from 1,549,062 cubic meters in February to 1,766,822 cubic meters in October. Sugawara's series storage model is described for quantitative estimation of recharging mechanism of groundwater. (Woodard-USGS)
W72-06909

SELECTED DIGITAL COMPUTER TECHNIQUES FOR GROUNDWATER RESOURCE EVALUATION,
Illinois State Water Survey, Urbana.
T. A. Prickett, and C. G. Lonnquist.
Illinois Water Survey Bulletin 55, 1971. 62 p, 83 fig, 1 tab, 36 ref.

Descriptors: *Groundwater, *Hydrogeology, *Aquifer characteristics, *Computer models, *Computer programs, Systems analysis, Input-output analysis, Digital computers, Analytical techniques, Groundwater movement, Water yield, Groundwater recharge.
Identifiers: Fortran language.

Generalized digital computer program listings are given that can simulate one-, two-, and three-dimensional nonsteady flow of groundwater in heterogeneous aquifers under water table, nonleaky, and leaky artesian conditions. Also included are programming techniques involving time varying pumpage from wells, natural or artificial recharge rates, the relationships of water exchange between surface waters and the groundwater reservoir, the process of groundwater evapotranspiration, and the mechanism of converting from artesian to water table conditions. The discussion of the digital techniques includes the necessary mathematical background, documented program listings, theoretical versus computer comparisons, and field examples. A finite difference approach is used to formulate the equations of groundwater flow. A modified alternating direction implicit method is used to solve the set of resulting finite difference equations. The programs are written in Fortran IV and will operate with any consistent set of units. (Woodard-USGS)
W72-06914

WATER RESOURCES OF THE UPPER WHITE RIVER BASIN, EAST-CENTRAL INDIANA,
Geological Survey, Washington, D.C.
L. W. Cable, J. F. Daniel, R. J. Wolf, and C. H. Tate.
Available from GPO, Washington, DC 20402 $1.00 (paper cover) Stock No. 2401-1182. Geological Survey Water-Supply Paper 1999-C, 1971. 38 p, 21 fig, 4 plate, 4 tab, 14 ref.

Descriptors: *Water resources, *Surface-groundwater relationships, *Water yield, *Water quality, *Indiana, Groundwater movement, River basins, Aquifers, Aquifer characteristics, Hydrologic data, Base flow, Hydrogeology, Streamflow, Flow rates, Chemical analysis, Precipitation (Atmospheric), Hydraulic conductivity.
Identifiers: *White River basin (Ind).

Groundwater discharge to the streams in the upper White River basin in Indiana sustains year-round streamflow. This discharge (base flow) is considered to be an index to the amount of groundwater available for development. The most permeable aquifers in the basin are the sand and gravel deposits of Quaternary age. The representative hydraulic conductivity of these aquifers ranges from 1,500 to 2,500 gallons per day per square foot. The long-term average streamflow in the basin is approximately 0.9 cubic feet per second per square mile. The yearly average discharge varies from about one-fourth to twice the long-term average. The 7-day 10-year low flow ranges from about 0.01 to 0.3 cubic feet per second per square mile; the main-stem flow ranges from 0.10 to 0.13 cubic feet per second per square mile. The water in the aquifers is predominately a very hard calcium bicarbonate type; it is generally high in iron and contains a moderate amount of dissolved solids. Fresh water (1,000 milligrams per liter dissolved solids or less) is present to depths of approximately 400 feet below land surface. The quality of the water in the White River deteriorates in the downstream direction owing to the cumulative effects of sewage effluent. (Woodard-USGS)
W72-06999

HYDROGEOLOGY OF A PLAYA NEAR AMARILLO, TEXAS,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 04B.
W72-07004

SEISMIC REFRACTION SURVEY OF PLEISTOCENE DRAINAGE CHANNELS IN THE LOWER GREAT MIAMI RIVER VALLEY, OHIO,
Geological Survey, Washington, D.C.
J. S. Watkins, and A. M. Spieker.
Available from GPO, Washington, D.C. 20402 Price - $1.25 paper cover. Geological Survey Professional Paper 605-B, 1971. 17 p, 7 fig, 1 plate, 4 tab, 30 ref.

Descriptors: *Groundwater, *Sedimentology, *Seismic studies, *Pleistocene epoch, *Ohio, Valleys, Surveys, Geology, Hydrogeology, Groundwater movement, Aquifers, Aquifer characteristics, Hydrologic data, Data collections, Lithification, Bedrock, Subsurface investigations, Geomorphology.
Identifiers: *Lower Great Miami River Valley, Groundwater hydrology.

Largely on the basis of seismic refraction data, the U.S. Geological Survey mapped the bedrock surface of the ancestral Great Miami River valley between Dayton, Ohio, and the Ohio River and determined the thickness of sand and gravel deposits in the buried valley. The data indicate that a major buried valley, 200-300 feet deep and about 2 miles wide, is entrenched in the bedrock. The ancestral valley generally follows the course of the present Great Miami River but is north and west of the river throughout much of its course. A younger buried valley, about 100 feet deep, is cut into bedrock below the present course of the Great Miami River. Seismic velocities in saturated and unsaturated sands, clays, and gravels within the buried valley vary systematically. In the unsaturated deposits, higher velocities are correlative with high clay content. Higher velocities are thought to be caused by higher water content of the clays. A general northeaste-southwest decrease in velocity in the saturated outwash deposits is thought to reflect better sorting in outwash deposits farther from the edge of the receding glacier. (Woodard-USGS)
W72-07007

MATHEMATICAL GROUND-WATER MODEL OF INDIAN WELLS VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
R. M. Bloyd, Jr., and S. G. Robson.
Geological Survey Open-file Report, November 12, 1971. 36 p, 15 fig, 7 tab, 6 ref.

Descriptors: *Groundwater movement, *Mathematical models, *Groundwater basins, *Model studies, *California, Water yield, Aquifers, Aquifer characteristics, Groundwater recharge, Hydrogeology, Storage coefficient, Water levels, Hydrologic data, Confined water, Pumping, Transmissivity.
Identifiers: *Indian Wells Valley (Calif).

A mathematical model of the Indian Wells Valley, California, groundwater basin was developed and verified. The alternating-direction implicit method was used to compute the mathematical solution. It was assumed that there are only two aquifers in the valley, one deep and the other shallow. Where the shallow aquifer occurs, the underlying deep aquifer is artesian. Flow between the aquifers under steady-state conditions is assumed to be in one direction, from deep to shallow. The transmissivity of the deep aquifer ranges from about 250,000 to 22,000 gallons per day per foot and from about 25,000 to 5,000 gallons per day per foot for the shallow aquifer. The storage coefficient for the deep aquifer ranges from 0.0001 to 0.20. Steady-state recharge and discharge in each aquifer was estimated to be 9,850 acre-feet per year. Groundwater pumping, sewage-effluent recharge, and capture of groundwater discharge occurred under non-steady-state conditions. Most of the groundwater pumpage is near Ridgecrest and Inyokern and in the area between the two towns. The verified model was used to generate 1983 water-level conditions in the deep aquifer. (Woodard-USGS)
W72-07008

UNDERGROUND STORAGE OF IMPORTED WATER IN THE SAN GORGONIO PASS AREA, SOUTHERN CALIFORNIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W72-07023

BIBLIOGRAPHY OF U.S. GEOLOGICAL SURVEY WATER-RESOURCES REPORTS FOR UTAH.
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 02E.
W72-07026

ANNUAL REPORT ON GROUND WATER IN ARIZONA, SPRING 1970 TO SPRING 1971.
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 04B.
W72-07027

WATER RESOURCES OF BIG SMOKY VALLEY, LANDER, NYE, AND ESMERALDA COUNTIES, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 02E.
W72-07030

2G. Water in Soils

HYDRAULIC CONDUCTIVITY MEASUREMENTS WITH A PRESSURE TRANSDUCER,
Illinois Univ., Urbana. Dept. of Agronomy.
A. R. Overman, J. H. Peverly, and R. J. Miller.
Soil Science Society of America Proceedings, Vol. 32, No. 6, p 884-886, November-December, 1968. 2 fig, 6 ref.

Descriptors: *Hydraulic conductivity, *Permeameters, *Permeability, Clay, Saturated flow, Laboratory tests.

A rapid method for measuring hydraulic conductivities of materials in the range 10-6 to 10-10 cm/sec is described. By using a pressure transducer as part of a decreasing head permeameter, the time constant for measurement is reduced. Only small volume transfers of water are required. An example is used to illustrate the method. (Skogerboe-Colorado State)
W72-06677

REDUCTION OF SULFATE TO SULFIDE IN WATERLOGGED SOIL,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W72-06678

ON THE DEFINITION OF CALICHE DEPOSITS,
L. F. Aristarain.
Zeitschrift fur Geomorphologie, Vol 15, No 3, p 274-289, September 1971. 5 fig, 49 ref.

Descriptors: *Caliche, *Calcium carbonate, *Soil types, *Arid lands, Geology, Rock properties, Soil properties, Soil formation, Calcareous soils, Hardpan, Marl, Bibliographies.

The term 'caliche' is used to describe many very different substances around the world, ranging from the Chilean nitrate deposits to almost pure limestone (Ca carbonate). Usage of the term is reviewed first for the rest of the world and then for the U.S. It is felt that the term should be limited to calcareous substances, specifically Ca carbonate substances. The various worldwide and local names used for the substance such as calcareous crust, travertine, marl, calcareous marl, tosca and hardpan are discarded for various reasons. A specific usage of the term caliche itself is proposed in order to clearly distinguish between rocks and deposits. The proposal that the term be used to apply only to substances of greater than 50% Ca carbonate composition is considered and rejected. The term caliche deposit is proposed here to define a body resulting from the epigenetic accumulation of Ca carbonate in unconsolidated sediments under conditions derived from soil processes in arid and semiarid regions. The process of formation of caliche deposits is designated calichification. Rocks resulting from calichification are termed caliche plus appropriate descriptive terms accounting for structural and textural characteristics. (Casey-Arizona)
W72-06729

SOIL-WATER TENSION AND THE MOVEMENT OF RHIZOBIA,
Ministry of Agriculture, Giza (Egypt). Dept. of Soils.
Y. A. Hamdi.
Soil Biology and Biochemistry, Vol 3, No 2, p 121-126, May 1971. 1 fig, 2 tab.

Descriptors: *Legumes, *Soil moisture, *Bacteria, Nitrogen-fixing bacteria, Sands, Soil types, Soil texture, Loam, Laboratory tests, Pores.
Identifiers: *Legume nodulation, *Rhizobium trifolii.

In earlier studies of the movement of rhizobia in soils, only slight attention was paid to the effects of water content and no study has defined the moisture limits for movement of these organisms. This study attempts to assay the influence of soil moisture tension on the movement of Rhizobium trifolii, using coarse and fine sands and a silt-loam soil. In all 3 soils, the distances which the rhizobia moved from the point of innoculation decreased as the matric suction increased. Analysis of the results showed that innoculum movement in these media was limited by moisture content rather than by reduced pore-neck diameter. The movement-limiting water contents were much higher than those limiting germination of clover seeds. Legume nodulation in partly dry sown soils is therefore likely to be affected due to failure of innoculum migration. (Casey-Arizona)
W72-06731

STUDIES ON THE ARTHROPODS AND MICROORGANISMS OF SOME LIBYAN SOILS: SOIL ARTHROPODS AND MICROORGANISMS FROM UNDER FOUR FRUIT TREES,
Libya Univ., Tripoli. Faculty of Agriculture; and Libya Univ., Tripoli. Faculty of Science.
A. M. Kolkaila, A. A. M. Makawi, and S. M. Hammad.
Libyan Journal of Science, Vol 1, p 21-30, May 1971. 1 fig, 5 tab, 16 ref.

Descriptors: *Arid lands, *Soil microbiology, *Soil microorganisms, *Soil physical properties, Soil types, Soil texture, *Soil moisture, On-site data collections, Microenvironment.

Several factors known to affect soil faunal types and their relative abundance are the moisture content of the soil, physico-chemical properties, the plants cultivated on such soils and agricultural practices. Soil samples, composed of fine sandy particles, low organic matter and low moisture content, were collected in February and in June from underneath 4 fruit trees--orange, olive, grape, and plum. Wild weeds were also collected from around the trees in these months and species lists are presented. The soil samples were tested for moisture percentage, water holding capacity, bulk density, particle density, porosity and percentage of organic matter. The arthropods and microorganisms collected are listed for each tree and month. (Casey-Arizona)
W72-06733

SEVERAL PROBLEMS IN NONUNIFORM SEEPAGE IN THE SLOPES OF STRUCTURES WITH VARIABLE BOUNDARY CONDITIONS,
G. N. Kononenko.
Gidravlika i Gidrotekhnika Sbornik, No. 6, p. 88-98, 1968. Translated from Russian, Bureau of Reclamation Translation 848, May 1971. 18 p, 3 fig, 8 ref.

Descriptors: *Seepage, *Groundwater flow, *Embankments, Phreatic lines, Canal seepage, Cofferdams, Earth dams, Hydraulic structures, Slopes, Discharge (Water), Flow, Reservoirs.
Identifiers: USSR, Boussinesq equation, Mathematical analysis, Boundary conditions.

Analysis methods are described for determining dynamic seepage flow and phreatic lines of an earth structure when the water level is changed linearly with time. These methods can be applied to seepage problems in earth dams, canals, cofferdams, trenches, and open pit mines. An example is given of the seepage flow and phreatic line calculations for an earth dam with a toe drain and a falling reservoir level. The mathematical derivation is based on the Boussinesq equations. (USBR)
W72-06740

EVAPOTRANSPIRATION FROM A SMALL CLAY CATCHMENT,
For primary bibliographic entry see Field 02D.
W72-06799

FIELD RADIOMETRIC DETERMINATIONS OF SOIL MOISTURE AND DENSITY (POLEVAYA RADIOMETRIYA VLAZHNOSTI I PLOTNOSTI POCHVO-GRUNTOV),
V. A. Yemel'yanov.
Atomizdat, Moscow, 1970. 334 p.

Descriptors: *Instrumentation, *Methodology, *Borehole geophysics, *Soil moisture, *Soil density, Soils, Soil density probes, Nuclear moisture meters, Logging (Recording), Radioactive well logging, Radiation, Gamma rays, Analytical techniques, Neutron activation analysis, Neutron absorption, Sampling, Measurement, Calibrations.
Identifiers: *USSR, *Radiometry, *Radiometers, Gamma-ray well logging, Gamma-gamma logging, Neutron logging, Neutron-neutron logging, Metrology.

This monograph examines the physical principles of radiation methods used to measure soil moisture and density. Soviet and foreign nuclear moisture meters and gamma density meters are described and evaluated in conjunction with field and surface radiometric techniques for measuring soil moisture and density. Detailed analysis of the factors responsible for the radiational and metrological characteristics of nuclear moisture meters, gamma-gamma, and gammascopic density meters is based on experimental studies by the author and on summarization of the world literature on the subject. Procedures for reducing errors in the use of neutron and gamma methods in agrophysical, soil-hydrological, and water improvement investigations and for enhancing the potentialities of radioisotope moisture and density

meters are outlined and demonstrated. (Josefson-USGS)
W72-06811

IRRIGATION INVESTIGATIONS IN OTAGO, NEW ZEALAND, IV. PHYSICAL PROPERTIES OF SOILS OF THE ARROW BASIN AND UPPER CLUTHA VALLEY,
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.
D. S. Rickard and G. G. Cossens.
New Zealand Journal of Agricultural Research, Vol. 11, p 701-732, 1968. 5 fig, 11 tab, 4 ref.

Descriptors: *Soil physical properties, *Irrigation, *Soil horizons, Rainfall, Available moisture, Wilting point, *Soil analysis, Soil density, Particle size, Irrigation effects, Soils.
Identifiers: New Zealand, *Yellow-brown earth, *Yellow-grey earth.

Physical properties, including the percentage of fine particles, organic carbon, 15-bar retention, field capacity, and available moisture show consistent increases between virgin soil groups formed under semiarid (brown-grey earths), subhumid (yellow-grey earths), and humid (yellow-brown earths) climates. Bulk density values decrease throughout the same sequence. There is a tendency for similar changes to occur with soils of increasing ground surface age within the brown-grey earths. There is an insufficient range of ground surface ages to establish this tendency for the other groups. Irrigation and associated management have tended to alter the properties of a particular soil group in the direction of those of the group formed under a higher rainfall. This tendency is not true for the bulk density, which is in most cases higher under irrigation. The available moisture held in the top 12 in. of the soils ranged from 1.58 in. to 4.30 in. If irrigation was applied at the wilting point, the soils in the three zonal groups would retain the following approximate amounts: brown-grey earths, 2 in. to 2 1/2 in.; yellow-grey earths, 2 1/2 in. to 3 1/2 in.; yellow-brown earths, 3 in. to 4 in. (Skogerboe-Colorado State)
W72-06825

NITROGEN ECONOMY OF CROPPED AND UNCROPPED FLOODED RICE SOILS UNDER FIELD CONDITIONS,
The International Rice Research Inst., Los Banos, Laguna (Philippines).
For primary bibliographic entry see Field 03F.
W72-06833

DRAINAGE WITH PERFORATED PLASTIC TUBING,
Forest Hydrology Lab., Wenatchee, Wash.
For primary bibliographic entry see Field 04A.
W72-06834

APPLIED NITROGEN LOSSES IN RELATION TO OXYGEN STATUS OF SOILS,
Agricultural Research Service, Brawley, Calif. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05B.
W72-06835

VARIATIONS OF SULFUR-34: SULFUR-32 RATIOS IN SOIL FRACTIONS IN WESTERN CANADA,
British Columbia Univ., Vancouver. Dept. of Soil Science.
L. E. Lowe, A. Sasaki, and H. R. Krouse.
Can J Soil Sci. 51 (1): 1971. 129-131.
Identifiers: Canada, Fertilizer, Fractions, Pedogenesis, Ratios, Soil, Sulfur-32, Sulfur-34, Variations, Western.

The range of 34S in soil fractions was comparatively large. The 34S/32S abundances for distinct S fractions of the same sample also showed marked variation. Such variations were too large to be ignored in 34S studies. The isotopic composition of the parent material, soil pH, aeration and temperature, degree of leaching, influx of groundwater or seepage, and duration of soil formation processes are all likely to influence the resulting distribution. A microbiological involvement in soil isotope fractionation is suggested. While the data presented do not permit rigorous interpretation of the role of various factors in determining the isotope distribution in the soils examined, the large variations in S isotope distribution will provide a valuable tool for the elucidation of S transformations in soil, and for studying both the history of indigenous soil S and the fate of applied fertilizer S.--Copyright 1971, Biological Abstracts, Inc.
W72-06870

CAPILLARY-DIFFUSION AND SELF-DIFFUSION OF LIQUID WATER IN UNSATURATED SOILS,
Kentucky Water Resources Inst., Lexington.
R. E. Phillips.
Available from the National Technical Information Service as PB-208 221, $3.00 in paper copy, $0.95 in microfiche. Research Report No 47, 1971. 39 p, 18 fig, 1 tab, 14 ref. OWRR A-011-KY (1).

Descriptors: Diffusion, *Soil water movement, *Capillary action, Tracers, Tritium, Soil moisture, Chlorides, Diffusivity, Capillary water.
Identifiers: *Capillary diffusion, *Self-diffusion.

To evaluate the effect of soil water content, clay type, and clay content upon the capillary-diffusion of liquid water in unsaturated soil, and to attempt to establish a functional relationship between capillary-diffusion and self-diffusion of liquid water in unsaturated soil, capillary-diffusion coefficients were measured by use of inflow and outflow methods. With both methods the capillary-diffusion coefficients decreased very rapidly with decreasing water content. The lighter textured soils had the higher diffusion coefficients over the entire moisture content range studied, 0 to 1 bar tension. Self-diffusion coefficients were measured over a moisture content range from air dryness to saturation using tritium as a tracer. Each of the soils had the same diffusion characteristics when the self-diffusion coefficients were expressed as a function of either water content or average number of water layers on the external surface of each mineral. As the water content decreased from saturation to near field capacity, the self-diffusion coefficients decreased very rapidly. An attempt was made to separate the self-diffusion coefficients into a liquid and a vapor component by use of C1-36 as a tracer. C1-36 was not a good tracer of liquid water movement in soil. (Knapp-USGS)
W72-06908

AN IMPROVED FORM OF SOIL-WATER DIFFUSIVITY FUNCTION,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
L. R. Ahuja, and D. Swartzendruber.
Soil Science Society of America Proceedings, Vol 36, No 1, p 9-14, January-February 1972. 5 fig, 1 tab, 25 ref. OWRR B-014-IND (1).

Descriptors: *Infiltration, *Diffusivity, *Soil water movement, *Computer programs, Numerical analysis, Saturated flow, Unsaturated flow, Hydraulic conductivity, Soil water, Soil moisture.

Soil-water diffusivity is expressed by a functional form which becomes infinite as the soil-water content approaches a constant value, such as the saturated or near-saturated value. The function begins at zero value, and shows an approximately exponential rise in the intermediate soil-water content range. When combined with an unsaturated hydraulic conductivity function, qualitatively reasonable forms for the relationship between water content and suction head can be inferred. A computer program was developed to determine the characterizing parameters in the function by a least-squares fit to experimental data for horizontal water absorption. The program uses an optimum-seeking technique with numerical solutions of the flow equations as obtained by Philip's method. For different types of soils and several bulk densities, the new functional form was compared with the commonly used exponential expression and was found to be more representative. (Knapp-USGS)
W72-06974

A DIGITAL SIMULATION OF THE DYNAMIC SOIL MOISTURE STATUS,
Mississippi Agricultural Experiment Station, State College.
B. P. Verma.
Transactions of the ASAE Vol 14, No 4, p 660-664, July-August 1971. 6 fig, 8 ref.

Descriptors: *Soil moisture, *Water balance, *Simulation analysis, Systems analysis, Mathematical models, Rainfalls, Evapotranspiration, Moisture content.

A soil moisture model was designed and tested for simulating soil moisture values for soil exposed to natural weather. For 43 days, the predicted values were usually within 10% of the actual data. The model is sensitive to the choice of a saturated soil moisture value and insensitive to the choice of an air-dry value. The relationship between diffusivity and soil moisture is a primary factor in determining the accuracy of the model. The choice of a depth increment for use in the simulation is important in that larger increments will make the 'computer soil' dry faster than actual soil. The simulation of the soil regime of the plant environment should be expanded to include other variables and their interactions, such as temperature and soil density. (Knapp-USGS)
W72-07003

DETERMINATION OF MOISTURE CONTENT WITH A GAMMA BACKSCATTER DENSITY GAUGE,
University of Strathclyde, Glasgow (Scotland). Dept. of Electronic Science.
O. Ciftcioglu, D. A. Byatt, and D. Taylor.
Journal of Soil Science, Vol 23, No 1, p 32-37, March 1972. 1 fig, 3 tab, 6 ref.

Descriptors: *Nuclear moisture meters, *Gamma rays, *Soil moisture meters, Calibrations, Instrumentation, Soil moisture, Soil water, Moisture content.
Identifiers: Soil density meters.

Gamma-radiation, backscatter gages, employed for the determination of the bulk density of soils, use integral mode counting. They are relatively insensitive to the presence of soil moisture and hence not generally suitable for monitoring soil moisture content. However, when differential mode counting is used with the window set at about 0.08 MeV, the phenomenon is one of multiple instead of single scattering. With a source-detector separation of the order of 20 cm, about eight Compton interactions are obtained and, as a multiplying factor is involved at each interaction, the increased response with hydrogen-containing material is easily observable. Under these conditions, the response for water compared with non-hydrogen-containing materials is an increase of 132 precent. This method can therefore be exploited to measure the moisture content of soils. (Knapp-USGS)
W72-07005

THE KINETICS OF HETEROGENEOUS ISOTOPIC EXCHANGE,
Fisons Ltd., Ipswich (England). Levington Research Station.
M. E. Probert, and S. Larsen.
Journal of Soil Science, Vol 23, No 1, p 76-81, March 1972. 1 tab, 10 ref.

Descriptors: *Ion exchange, *Phosphates, *Soil chemistry, *Tracers, Radioisotopes, Fertilizers, Water chemistry.

Identifiers: Isotopic exchange.

Isotopic exchange of phosphate ions between soil and solution was examined with particular emphasis on the slower reaction involving the incorporation of the tracer in the solid phase. This reaction follows the very fast exchange reaction between the solution and the surface of solid. Experimental data fitted both an equation composed of a sum of exponentials and a much simpler two-constant equation. The goodness of fit was similar in each case, but the exponential type of equation was not useful as a means of elucidating the mechanisms involved. The two-constant equation may be derived from the kinetics of crystallization and recrystallization processes, and therefore provides an interpretation which is amenable to experimental verification. (Knapp-USGS)
W72-07021

AGEING OF HYDROLYSED IRON (III) SOLUTIONS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Soils and Crops.
P. H. Hsu, and S. E. Ragone.
Journal of Soil Science, Vol 23, No 1, p 17-31, March 1972. 7 fig, 3 tab, 23 ref. NSF Grant GA-10715.

Descriptors: *Hydrolysis, *Iron compounds, *Aqueous solutions, *Chemical precipitation, Iron, Hydrates, Oxidation, Hydrogen ion concentration, Alkalis (Bases).
Identifiers: Iron hydroxides.

Three 0.01M Fe (C1O4)3 solutions of R (mole ratio)=0,1, and 2, respectively, were studied over a period of 8 months. The R = 0 solution was initially light yellow and clear but rapidly changed to a dense cloudy suspension after a 9-day period. Hydrolyzed species rapidly grew from 10 nm to 650 nm. Settleable FeOOH precipitate was first observed in 5 weeks with 23% of its iron noted as precipitate at the end of 5 months. The R = 1 and R = 2 solutions were reddish-brown, with low turbidity. Rapid hydrolysis and polymerization were observed immediately after preparation. The hydrolyzed species gradually grew in size during aging and no settleable FeOOH precipitate was observed for at least 2 years. A hypothesis based on Lamb and Jacques's model of hydrolysis is proposed to interpret the reactions taking place in these three solutions. In the R = 0 solution, the initial number of nuclei for condensation is low, whereas the potential supply of Fe (OH)3 is abundant. In the R = 1 and R = 2 solutions the number of nuclei initially formed is high, whereas a limited amount of monomeric Fe (OH)3 is available for condensation. The initial number of nuclei relative to the concentration of monomeric species is the key factor that governs the appearance and properties of these solutions. (Knapp-USGS)
W72-07022

THE EFFECT OF SOIL WATER AND AERATION ON SEED GERMINATION,
Volcani Inst. of Agricultural Research, Bet Dagan (Israel).
For primary bibliographic entry see Field 02I.
W72-07041

THE EFFECT OF SHELTER ON THE TEMPERATURE AND MOISTURE OF DESERT SANDS,
All-Union Scientific Research Inst. for Agroforestry Amelioration, Moscow (USSR).
For primary bibliographic entry see Field 03B.
W72-07044

PATTERNED GROUND IN SOUTHEAST LIBYA,
Libya Univ., Tripoli; and Occidental of Libya, Inc., Tripoli.
J. R. Underwood, Jr. and E. P. Fisk.
Libyan Journal of Science, Vol 1, No 5, p 96-103, May 1971. 3 fig, 10 ref.

Descriptors: *Arid lands, *Geologic formations, *Geomorphology, *Glacial soils, *Sandstones, Temperature, Freezing, Drying, Soil formation, Land forming, Aquifers.
Identifiers: *Libya, *Sahara Desert.

A small area of approximately 2000 sq m is described. The area consists of sorted stone polygons, and was discovered in the Sahara Desert in southeastern Libya. The rather featureless surface on which the polygons are located is underlain by unconsolidated quartz sand and silt. These underlying materials as well as the granules, pebbles and cobbles of the borders of the polygons are derived from an outcropping of Lower Cretaceous Nubian Sandstone. The stones of the polygons are irregular somewhat tabular and elongate indurated granules, pebbles and cobbles or quartzose sandstone with subangular uneven surfaces. They have a mean diameter of about 3 cm. The average maximum diameter of the polygons is 2.2 m. and their intersections are largely orthogonal. They are most likely the result of freezing and thawing which probably occurred about midway in the last glacial period when a major input of water into the aquifers of the region occurred and when average annual temperatures were about 6 degrees C lower than at present. It seems less likely that they were formed during one or more of the post-glacial pluvial periods or as a result of desiccation. (Casey-Arizona)
W72-07049

INFILTRATION AND WATER REPELLENCY IN GRANITIC SOILS,
Forest Service (USDA), Reno, Nev., Intermountain Forest and Range Experiment Station.
R. O. Meeuwig.
USDA Forest Serv. Res. Pap INT-lll, December 1971, 20 p, 6 fig, 8 ref, append.

Descriptors: *Wettability, *Infiltration, Infiltrometers, Forest soils, Vegetation effects, Nevada.
Identifiers: *Granitic soils.

Water repellency is common in the granitic soils in the Carson Range of the Sierra Nevada, and can be a major limiting factor in the capacity of these soils to absorb high-intensity summer rainfall. Results of infiltrometer tests indicate that water repellency often impedes infiltration under pine litter but rarely does so under chaparral cover. Water repellancy tends to develop in a continuous layer at the soil surface under pine litter. Fortunately, this layer is usually disrupted by root channels, rodent burrows, and other biologic activity; water can penetrate at a few points and spread out into the wettable subsoil. Patches of water-repellent soil were often found under chaparral but no tendency for the development of a continuous layer was detected.
W72-07077

ROLE OF MG IN THE FORMATION OF SOLONETZIC SOILS ON IRRIGATION WITH MINERALIZED WATERS,
For primary bibliographic entry see Field 03C.
W72-07113

INFLUENCE OF SOIL PROPERTIES AND CULTURAL PRACTICES ON EVAPORATION OF WATER FROM SOIL,
Clemson Univ., S. C. Water Resources Research Inst.
For primary bibliographic entry see Field 02D.
W72-07128

EFFECT OF POLYACRYLAMIDE ON CERTAIN PHYSICAL PROPERTIES OF SOIL AND THE EROSION RESISTANCE OF SANDY LOAMY SOILS IN THE BURYAT ASSR (IN RUSSIAN),
N. B. Namzhilov, and M. Z. Bubeev.
Tr Buryat S-Kh Inst. 19. 96-102. 1969

Identifiers: Acrylamide, Aggregates, Buryat-ASSR, Erosion, Loamy, Physical, Resistance, Sandy, Soils, Stable.

In the presence of various concentrations of high-molecular organic polymer-polyacrylamide (up to 0.5% solution), the amount of water-stable aggregates (>1mm) in soils increased 2-3 times. The best effect was obtained using polyacrylamide at soil moisture content of 18 and 20% (with reference to the oven-dry weight of soil).--Copyright 1972, Biological Abstracts, Inc.
W72-07257

EFFECT OF AMMONIA LIQUOR ON THE WATER-RESISTANCE OF SOIL STRUCTURE, (IN RUSSIAN),
E. A. Reppo.
Sb Nauchn Tr Est Nauchno-Issled Inst Zemled Melior. 16: 158-165. 1969.
Identifiers: Ammonia, Liquor, Resistance, Soil, Structure.

Addition of ammonia liquor to naturally moist calcareous soil did not impair the water-resistance of its structure; inactive humus was converted to an active form under its effect.--Copyright 1972, Biological Abstracts, Inc.
W72-07260

SOME SPECIFIC FEATURES OF WATER REGIME IN DEEPLY FREEZING MEALY-CALCAREOUS CHERNOZEM SOILS OF THE SELENGA MIDHIGHLANDS, (IN RUSSIAN),
T. K. Tsybzhitov.
Tr Buryat S-Kh Inst. 19. 122-135. 1969.
Identifiers: Calcareous, Capillary, Chernozem, Discontinuous, Freezing, Highlands, Mealy, Moisture, Point, Regime, Seasonal, Selenga, Soils, USSR, Wilting.

The moisture regime was most active in the top 0-150 cm soil layer, below which the moisture contents varied from wilting point (WP) to discontinuous capillary moisture (DCM). The top 0-150 cm layer is desiccated to WP in spring and moistened above DCM during the rainfall season in summer, creating considerable reserve of available moisture.--Copyright 1972, Biological Abstracts, Inc.
W72-07263

CONTRIBUTION TO STUDIES AND CLASSIFICATION OF WATERLOGGED LANDS, (IN RUSSIAN),
A. F. Timofeev.
Tr Kirov S-Kh Inst. 22 (44): 183-190. 1969.
Identifiers: Classification, Coarse, Humus, Lands, Podzols, Waterlogged.

The morphological properties of soils were studied in relation to their wetting on coarse-humus podzols, peat-humus-gley and peat soils in the Kirov Region. Permanent waterlogging of bog soils affects their site class. A comprehensive classification is recommended for waterlogged soils.--Copyright 1972, Biological Abstracts, Inc.
W72-07266

THE CHEMICAL, PHYSICAL AND SALINITY CHARACTERISTICS OF TWENTY-SEVEN SOIL MEDIA,
Agricultural Research and Educational Center, Bradenton, Fla.
W. E. Waters, William Llewellyn, and James Nesmith.
Proc Fla State Hort Soc. 83. 1970. 482-488.
Identifiers: Chemical, Fertilizer, Media, Ornamental, Physical, Plants, Salinity, Soil.

Twenty-seven soil media were formulated from combinations of builders sand, shavings, perlite, German peat and Florida peat. Each medium was characterized by standard laboratory chemical and physical determinations, moisture holding capaci-

ty as affected by 3 container sizes and soluble salt levels as affected by 3 rates of fertilization and 3 procedures for determining soluble salts. Important factors for consideration in formulating media for ornamental plants included appearance, shrinkage loss, ignition loss, bulk density, water holding capacity, non-capillary air space, pH, salinity characteristics along with a soil test on basic media ingredients. Moisture holding capacity of each mix in different pot sizes increased greatly as the pot size decreased. Media composition greatly affected soluble salt levels at different fertilization rates. The saturated paste technique of determining salinity was superior to determinations on either weight or volume basis.--Copyright 1971, Biological Abstracts, Inc.
W72-07268

STRUCTURAL FEATURES OF SOIL COVER IN THE NORTHWEST OF THE BARABA LOWLAND (IN THE NOVOSIBIRSK REGION), (IN RUSSIAN),
A. A. Khantulev, P. P. Kerzum, G. V. Shvedchikov, A. G. Balashov, and T. M. Rubinshtein.
Uch Zap Leningr Gos Univ. 348. 43-54. 1969.
Identifiers: Baraba, Bog, Cover, Forest, Lowland, Meadow, Northwest, Novosibirsk, Plant, Soil, Structural, USSR.

The territory has a continental climate, with annual precipitation 300-350 mm, level or with crested ridges, predominance of heavy calcareous loams in the soil-forming rocks and a meadow-bog-forest plant cover. A detailed description of soil cover according to main geomorphological units, e.g., the valley of the Om' River, the drained area near the river, the Irtysh plain and the plain with lakes and crested ridges is given. Schematic soil maps are provided for certain typical areas of the latter plain.--Copyright 1972, Biological Abstracts, Inc.
W72-07269

EFFECT OF DEFLATION ON FERTILITY OF SOILS IN THE PAVLODAR REGION, (IN RUSSIAN),
L. K. Putro, and T. K. Dosmukhamedov.
Tr Inst Pochvoved Akad Nauk Kaz SSR. 18: 153-160. 1970.
Identifiers: Deflation, Distribution, Eluviation, Fertility, Mineral, Pavlodar, Soils.

Deflation depletes the upper horizons of dark chestnut soils in the finest clay particles, Zn, Cu, Co, organic matter and nutrients. Losses of B are not exclusively due to deflation but also to its eluviation into underlying horizons. The upper horizons of eroded soils have a higher content of total Mn than underlying horizons. The loss of this element by deflation is probably balanced or exceeded by its high biological accumulation. Mo distribution over the profile of eroded and uneroded soils is uniform.--Copyright 1972, Biological Abstracts, Inc.
W72-07273

STUDIES OF THE TRANSFORMATION OF N FERTILIZERS IN IRRIGATED SOIL, (IN RUSSIAN),
A. S. Demchenko, L. V. Brazhnikova, M. N. Tarasov, and V. D. Demidov.
Gidrokhim Mater. 53. 49-54. 1969.
Identifiers: Aeration, Fertilizers, Irrigated, Moisture, Nitrogen, Soil, Temperature, Transformations.

In laboratory experiments, with optimum moisture content and temperature and satisfactory aeration, ammonium N from (NH4)2SO4 fertilizer was completely nitrified 20 days after application. With nonoptimum moisture content and temperature, 2/3 of the ammonium N was nitrified in 30 days.--Copyright 1972, Biological Abstracts, Inc.
W72-07277

2H. Lakes

NORRIS RESERVOIR FERTILIZER STUDY: I. EFFECTS OF FERTILIZER ON FOOD CHAIN ORGANISMS AND FISH PRODUCTION,
Tennessee Valley Authority, Norris.
For primary bibliographic entry see Field 05C.
W72-06599

NORRIS RESERVOIR FERTILIZER STUDY: II. EFFECTS OF THERMAL STRATIFICATION AND NUTRIENT AVAILABILITY ON THE PRODUCTIVITY OF RESERVOIR PHYTOPLANKTON,
Tennessee Valley Authority, Muscle Shoals, Ala.
For primary bibliographic entry see Field 05C.
W72-06600

WATER USE IN THE GREAT LAKES BASIN,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 06D.
W72-06679

CIRCULATION AND WATER MOVEMENT IN LAKE ERIE,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
Paul F. Hamblin.
Canada Department of Energy, Mines and Resources. Inland Waters Branch, Scientific Series No. 7, 1971. Ottawa. 49 p, 25 fig, 36 ref, append.

Descriptors: *Water circulation, *Diffusion, *Currents (Water), *Lake Erie, Flow, Movement, Lakes.

Presently available knowledge of the circulation, water movements and diffusive processes occurring in the three Basins of Lake Erie is summarized. Residence time, theory of lake circulation and diffusion are discussed. In the Western Basin the current decreases from its surface value to zero at the bottom while remaining in a constant direction throughout the vertical column of water. The currents of the region are typically unsteady both in direction and in speed. The permanent open lake regime of the Central Basin appears to be one of a wind-produced easterly surface flow balanced by motion at intermediate and bottom depths. Near the shorelines the system of flow is complicated by the vertical circulation that must exist at the boundary. Surface flow in the Eastern Basin is similar to the Central Basin. The surface currents are erratic except for the head of the Niagara River where hydraulic currents overrule. The bottom waters are relatively quiescent with the cross-lake return flow modified by the steep gradients of the bottom. (Fosdick-CCIW)
W72-06680

SUBMERSIBLE OPERATIONS IN GEORGIAN BAY AND LAKE ERIE - 1970,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 08C.
W72-06681

A SHORT NOTE ON THE SPEED CALIBRATION OF THE GEODYNE MODEL 920 CURRENT METER,
For primary bibliographic entry see Field 07B.
W72-06684

THE NIAGARA RIVER PLUME. PART I. TEMPERATURE AND CURRENT STRUCTURE IN THE NIAGARA RIVER PLUME. PART II. THE MIXING OF THE NIAGARA RIVER PLUME IN LAKE ONTARIO,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
Henry S. Weiler, and C. Raj Murthy.
Canada Department of Energy, Mines and Resources. Inland Waters Branch Technical Bulletin No. 38, 1971. Ottawa. 49 p, 33 fig, 1 tab, 2 ref.

Descriptors: *Dispersion, *Currents (Water), *Diffusion, *Water circulation, *Dye releases, *Turbulent flow, *Lake Ontario, Air-water interfaces, Water temperature, Lakes.
Identifiers: *Niagara River.

A descriptive study off the mouth of the Niagara River was carried out in 1968 to obtain information on the dynamic behaviour of the river's plume, both in terms of gross movement and diffusive properties. Temperature surveys, drogue tracking experiments, and infrared line scanner mosaics show that the river's plume is strongly influenced by the dominant winds of the day before the experiment, and to a lesser extent those of the preceding day. Response time of the plume to persistent changes in wind was estimated to be between 1 and 2 days. Surface currents in the lake, driven by over-lake winds, controlled the motion of the plume; the motion was quite varied and complex, depending on the wind fields encountered. Part II encompasses the diffusion studies carried out in the same area. The mixing of the river's plume with the main body of the lake takes place in two stages. Fairly close to the river's mouth, very strong river-type mixing was found. Beyond this area, buoyant surface spread of the warmer river water over the colder lake water occurred. (CCIW)
W72-06685

WASTE HEAT INPUTS TO THE GREAT LAKES OF NORTH AMERICA,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 05B.
W72-06688

A SYNOPTIC STUDY FOR EVALUATING THE ROLE OF THE GREAT LAKES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
Joseph Mac Dowall.
In: International Association of Scientific Hydrology Proceedings of the Reading Symposium - July 1970 - World Water Balance. p. 91-103. 4 fig, 12 ref.

Descriptors: *International Hydrological Decade, *Lake Ontario, Data collections, Synoptic analysis, Great Lakes.

The International Field Year for the Great Lakes is a synoptic study of the Lake Ontario Basin and is being conducted by Canada and the United States. Working groups have designed research programs in four areas. Water movements will be studied by a lake-wide network collecting information on long internal waves and persistent large-scale currents. The meteorology projects will study evaporation, precipitation and lake effect storms to improve understanding of local and global weather. Energy balance studies include heat flux, ice extent, radiation, stored energy and thermal inputs. The terrestrial water budget will study the interchange of water between the basin and the lake. (Fosdick-CCIW)
W72-06689

MICROBIOLOGICAL STUDIES OF OXYGEN DEPLETION IN THE LAKE ERIE CENTRAL BASIN,
Department of National Health and Welfare, Kingston (Ontario). Div. of Public Health Engineering.

For primary bibliographic entry see Field 05C.
W72-06690

PRELIMINARY STUDIES ON THE EFFECT OF THE LAKE ONTARIO THERMAL BAR IN CONFINING BACTERIA TO THE NEAR--SHORE REGION,
Department of National Health and Welfare, Kingston (Ontario). Div. of Public Health Engineering.
For primary bibliographic entry see Field 05B.
W72-06692

STRONTIUM 90--DIFFUSIONAL TRANSPORT IN SEDIMENTS OF THE GREAT LAKES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 05B.
W72-06699

POND POPULATIONS OF FISHES STUDIED BY MULTIPLE MARK-RECAPTURE METHOD, (IN FINNISH),
Oulu Univ. (Finland). Dept. of Zoology.
Esko A. Lind, and Juhani Turunen.
Luonnon Tutkija. 75 (2): 29-35. 1971. Illus (Engl. summ.)
Identifiers: Capture, Fishes, Lota-Lota, Mark, Method, Multiple, Perca-Fluviatilis, Phoxinus-Phoxinus, Pond, Populations.

The population structure of the fresh-water fish in a pond in NE Finland was studied. The area of the pond is about 2 ha. The greatest depth is 5 m. The fish were caught at marked points, were measured, weighed, marked and released. Three spp. were recorded, Perca fluviatilis, Lota lota and Phoxinus phoxinus. The total quantity, size classes and habitat preferences were determined.--Copyright 1971, Biological Abstracts, Inc.
W72-06709

VERTICAL DISTRIBUTION OF PLANKTONIC ROTIFERS IN A MEROMICTIC LAKE; BLANKVATN NEAR OSLO, NORWAY,
Zoologisk Museum, Oslo (Norway).
Petter Larsson.
Norw J Zool. 19 (1): 47-75. 1971. Illus.
Identifiers: Blankvatn, Distribution, Lake, Meromictic, Migration, Norway, Oslo, Planktonic, Rotifers, Temperature, Vertical.

The vertical distribution of euplanktonic rotifers in a lake with biogenic meromixis is seen in relation to season, day or night sampling, temperature and oxygen tension. The taxonomy of the forms is also discussed. The rotifers were divided into 3 groups: perennial-surface forms, perennial-chemocline forms and summer-surface forms. Vertical distribution varied throughout the year, either as increase or decrease of the space inhabited, or with shifting of the layer with greatest density. Diurnal migration was restricted to 1 sp. and 1 season. The temperature seemed to be a limiting factor in total distribution only in minor degree, but it might influence the maxima. The chemocline forms seemed to tolerate lower O2 tensions than the surface forms.--Copyright 1971, Biological Abstracts, Inc.
W72-06736

THE ALGAL FLORA OF THE INLAND WATERS AROUND TASHKENT,
For primary bibliographic entry see Field 05C.
W72-06739

A MATHEMATICAL MODEL OF THE WHITE NILE SYSTEM UPSTREAM OF PAKWACH, TECHNICAL NOTE,
Ministry of Mineral and Water Resources, Entebbe (Uganda). Dept. of Water Development.
H. L. de Baulny, and D. Baker.
Uganda Water Development Department Technical Note, 1970. 15 p, 4 fig.

Descriptors: *Hydrology, *Lakes, *Forecasting, *Mathematical models, Analytical techniques, Regression analysis, Rainfall, Hydrologic data, Inflow, Discharge (Water), Water level fluctuations.
Identifiers: *Lake Victoria, White Nile system (Africa).

The White Nile system of the Lakes Victoria, Kyoga and Albert is the subject of a hydrometeorological investigation on behalf of the Governments of Kenya, Tanzania, Uganda, the Sudan and the United Arab Republic. Model studies of Lake Victoria levels (or change in storage) were made by means of multiple linear regression using rainfall as the only factor, relating evaporation and inflow to it. Outflow was not directly related to rainfall but to the lake level. Given an initial level and rainfall, the change of storage as given by the multiple linear regression provides a new value of lake level and hence a new discharge which will, together with the next month's rainfall form the next input. Other modeling techniques allow for the inclusion of lake inflow and evaporation to each of the three lakes, and in addition will have a rainfall input to Lakes Kyoga and Albert that although based on the pseudo-input for Lake Victoria will be adjusted by linear regression and incorporate also a random component. (Woodard-USGS)
W72-06795

NEW DIRECTIONS IN MODERN LIMNOLOGY, (NOVYYE NAPRAVLENIYA V SOVREMENNOY LIMNOLOGII),
For primary bibliographic entry see Field 05C.
W72-06803

THE HYDROCHEMICAL CHARACTERISTICS OF PONDS OF THE LUGANSK REGION,
Kommunarsk Mining-Metallurgical Inst. (USSR).
A. D. Balukha.
Hydrobiological Journal, Vol 5, No 6A, p 32-36, 1969. 2 fig, 7 ref. (Originally published in Gidrobiologicheskiy Zhurnal, Vol 5, No 4, 1969, p 80-84).

Descriptors: *Ponds, *Water chemistry, *Water analysis, *Chemical analysis, *Water quality, Hardness (Water), Salinity, Salts, Ions, Groundwater, Maps.
Identifiers: *USSR, *Ukraine, Lugansk Oblast, Biogenous substances, Mineralization.

Investigations were conducted in 1964-68 to study the chemical composition of waters of 139 ponds in the Lugansk Region of the Eastern Ukraine. Chemical composition of the pond waters is determined by the physiographic conditions of the area and by the character of the contributing basins. Five types of pond waters were identified on the basis of their salt content: (1) sulfate (82 ponds); (2) bicarbonate (31 ponds)' (3) bicarbonate-sulfate (17 ponds); (4) chloride (3 ponds); and (5) waters of mixed salinity (6 ponds). Mineralization of the pond waters varied between 0.3 and 3.1 g/liter and the hardness of waters between 3 and 32 meq/liter. (Josefson-USGS)
W72-06807

VARIATIONS IN THE THERMIC AND OXYGEN REGIME OF LAKE SEVAN AND THEIR EFFECT ON SOME BIOLOGICAL PROCESSES,
For primary bibliographic entry see Field 05C.
W72-06818

LIMNOLOGICAL STUDIES IN BELGIUM: IV. THE VIEIL-ESCAUT POND IN BORNEM,
Institut Royal des Sciences Naturelles de Belgique, Brussels.
For primary bibliographic entry see Field 02K.
W72-06827

LIMNOLOGICAL STUDIES IN BELGIUM: III. A POND AT UITBERGEN,
Institut Royal des Sciences Naturelles de Belgique, Brussels.
For primary bibliographic entry see Field 02K.
W72-06828

A CORING DEVICE FOR UNCONSOLIDATED LAKE SEDIMENTS,
Federal Water Pollution Control Administration, Athens, Ga. Southeast Water Lab.
For primary bibliographic entry see Field 07B.
W72-06831

GENERAL HYDROLOGY OF THE GREAT LAKES AND RELIABILITY OF COMPONENT PHASES,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
D. E. Witherspoon.
Technical Bulletin No 50, 1971. 14 p, 5 fig, 2 tab, 6 ref.

Descriptors: *Hydrology, *Great Lakes, *Hydrologic data, *Water balance, Equations, Precipitation (Atmospheric), Runoff, Evaporation, Storage, Water supply, Hydrologic cycle.
Identifiers: *Great Lakes hydrologic system.

The component phases of the hydrology of the Great Lakes are expressed in two equations, (one for the land basins of the Great Lakes and one for the lake areas of the Great Lakes). To demonstrate the general function of the system, the component phases of its hydrology and their relationship to the land and lake equation are discussed. In order to describe the month-by-month variation of the component phases of the hydrology of the Great Lakes and consequently their reliability, two statistics are used. These are the mean or average and the standard deviation. If a variable is normally distributed about the mean or average, about 68% of the population will be within one standard deviation on either side of the mean. These statistics provide some concept of the dispersion of the components about the monthly mean and are a measure of their reliability. The data represent the 16 years from October 1950 to September 1966. (Woodard-USGS)
W72-06918

CANADA'S INTERNATIONAL WATERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 06E.
W72-06925

INVESTIGATION OF ICE REGIME OF RIVERS AND RESERVOIRS (ISSLEDOVANIYE LEDOVOGO REZHIMA REK I VODOKHRANILISHCH).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W72-06929

ICE REGIME OF USSR RESERVOIRS (LEDOVYY REZHIM VODOKHRANILISHCH SSSR),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W72-06930

ICE-THERMAL REGIME OF THE KAKHOVKA RESERVOIR IN THE ZONE OF CONSTRUCTION OF THE ZAPOROZH'YE HYDROELECTRIC POWERPLANT (OSOBENNOSTI LEDOTERMICHESKOGO REZHIMA KAKHOVSKOGO VODOKHRANILISHCHA V ZONE STROITEL'STVA ZAPOROZHSKOY GRES),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W72-06931

TEMPERATURE REGIME OF VOLGA RIVER RESERVOIRS DURING PERIOD OF COMPLETE ICE COVER (TEMPERATURNYY REZHIM VOLZHSKIKH VODOKHRANILISHCH V PERIOD LEDOSTAVA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W72-06932

ENVIRONMENTAL FACTORS AFFECTING THE UTILIZATION OF GREAT LAKES FISH AS HUMAN FOOD,
For primary bibliographic entry see Field 05C.
W72-06937

THE DISTRIBUTION AND ABUNDANCE OF THE MACROBENTHOS OF LAKE BURTON, GEORGIA,
Georgia Univ., Athens. Dept. of Zoology.
J. E. Schindler, Lynn Raulerson, and R. W. Miller.
Bull Ga Acad Sci. 29 (3): 201-207. 1971. Maps.
Identifiers: Abundance, Benthos, Distribution, Georgia, Lake Burton, Oligochaetes.

A survey of the macrobenthos in Lake Burton, Georgia, was conducted in Aug., 1970. Oligochaetes were the dominant macrobenthos, with densities up to 20,000/m2. Although the density of oligochaetes was correlated with depth, deposition of organic material may also influence distribution and abundance.--Copyright 1971, Biological Abstracts, Inc.
W72-06946

BOTTOM SEDIMENTS OF LAKE CHAMPLAIN: 1965-1971,
Vermont Univ., Burlington. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-06975

THE LECZYN-WLODAWA LAKE AREA AS LIFE-MEDIUM AND INVESTIGATION OBJECT, (IN POLISH),
Gabriel Brzek.
Przegl Zool. 14 (4): Map. 1970. (English summary). 354-362.
Identifiers: Lake, Leczyn-Wlodawa, Life, Medium, Meliorative, Poland.

Studies were made to explain in what measure and at what rate the hydrotechnic and meliorative measures influence the primary physicochemical and biological character of these lakes and the trend of changes occurring in their biocenosis.--Copyright 1971, Biological Abstracts, Inc.
W72-06992

TEMPERATURE PREDICTION IN STRATIFIED RESERVOIRS,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05B.
W72-07009

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 1.--NORTH ATLANTIC SLOPE BASINS.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-07011

INDEX TO SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 3.--OHIO RIVER BASIN.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-07012

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 5--HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-07013

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 11.--PACIFIC SLOPE BASINS IN CALIFORNIA.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-07014

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 12. PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-07015

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 13. SNAKE RIVER BASIN.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-07016

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 14. PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-07017

UTILIZATION OF THE ALGA SPIRULINA AS A PROTEIN SOURCE,
Instituto Nacional de la Nutricion, Mexico City.
H. Bourges, A. Sotomayor, E. Mendoza, and A. Chavez.
Nutr Rep Int. 4 (1): 1971. 31-43.
Identifiers: Alga, Corn-M, Human, Protein, Rat, Rztio, Rice-M, Safety, Spirulina, Wheat-M.

Spirulina is a microscopic alga which naturally grows in both lake Texcoco (Mexico) and lake Chad (Central Africa) and which may be a source of protein for human consumption due to its high yields, its simple culture and harvesting requirements and its apparent safety. The spray-dried alga from lake Texcoco has 64% of protein, with a PER (protein efficiency ratio) of 2.61 plus or minus 0.15 and a NPU (net protein utilization) of 56.6 plus or minus 4.3 against 2.97 and 61.5 for the casein standard (about 90% of the casein's quality). The tolerance of rats to a 100 days period of feeding on Spirulina-rich diets was good and no histological abnormalities were found in several organs examined. A set of mixtures based on staple cereals and Spirulina were nutritionally evaluated; Spirulina plus wheat showed a PER and NPU of about 90% of the values of casein, and other mixtures based on corn and Spirulina or corn, rice and Spirulina had also a reasonably good protein quality.--Copyright 1971, Biological Abstracts, Inc.
W72-07048

BENTHIC FAUNA AND SEDIMENTS IN THE NEWLY CREATED LAKE KARIBA (CENTRAL AFRICA),
Nuffield Lake Kariba Research Station (Rhodesia), and Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
A. J. McLachlan, and S. M. McLachlan.
Ecology, Vol. 52, No. 5, p. 800-809, 1971. 5 fig, 4 tab, 36 ref.

Descriptors: *Biomass, *Lake shores, *Lake beds, *Thermocline, *Thermal stratification, Lake soils, Animal populations, On-site investigations, Beaches, Beach erosion, Sedimentation.

After Lake Kariba reached a maximum retention level, an annual fluctuation in lake level of up to 8 m has occurred. The water-level fluctuations have affected water chemistry, aquatic macrophytes benthic fauna and shoreline processes. A thermocline became established early in the lake's development and thermal stratification has persisted each year during the hot months with the thermocline at a depth of 15-20 m. The submerged Kariba soils were much like their parent materials, having low CEC values, but they are undergoing changes as a result of shoreline erosion, river debris deposition and influence of river sediments. On gradually shelving coasts, beaches developed; while on sheltered, little erosion took place but organic debris accumulation was rapid. The distribution of fauna appeared to be influenced by shoreline type and thermal stratification. No fauna lived in the summer anaerobic profundal zone. A substantial single species chironomid population was established. The fauna off the gradually shelving exposed coast was quite distinct and showed a significant decrease of chironomid biomass in open water. A positive association between organic carbon and chironomid biomass was established for profundal mud in winter as well as an inverse association between coarse sand and littoral biomass. Along sheltered coasts, faunal biomass was inversely related to biomass. (Casey-Arizona)
W72-07065

HYDRARCH SUCCESSION AND NET PRIMARY PRODUCTION OF OXBOW LAKES IN CENTRAL ALBERTA,
Alberta Univ., Edmonton. Dept of Botany.
A. G. Van Der Valk, and L. C. Bliss.
Can J Bot. 49 (7): 1177-1199. 1971. Illus.
Identifiers: Alberta, Canada, Chemistry, Chlorophyll, Communities, Crop, Emergent, Floating, Hydrarch, Index, Lakes, Leaf, Macrophytes, Meadow, Net, Oxbow, Primary, Production, Standing, Submerged, Succession.

The plant communities in a series of 15 oxbow lakes were examined to determine their successional sequence and productivity. Twelve communities were recognized as a result of analyses carried out on the phytosociological data. Water chemistry and water level fluctuations caused by periodic flooding are the major factors controlling plant distribution and succession. The maximum above-ground standing crop of communities follows a definite pattern with succession: from submerged (ca. 200 g/m2), through floating-leaved (ca. 210 g/m2), to the emergent community (ca. 465 g/m), there is a stepwise increase in annual production, which declines in the meadow community (ca. 325 g/m2). Leaf area index does not change with succession: it remains between 3 and 4 in all the stages examined. Chlorophyll follows a pattern similar to standing crop, except that submerged communities contain more chlorophyll than floating-leaved: submerged (0.24-0.92 g/m2), floating-leaved (0.29-0.80 g/m2), emergents (0.62-2.13 g/m2) and meadow (0.54-1.42 g/m2). --Copyright 1971, Biological Abstracts, Inc.
W72-07069

OPTICAL DENSITY PROFILES AS AN AID TO THE STUDY OF MICROSTRATIFIED PHYTOPLANKTON POPULATIONS IN LAKES,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 05C.
W72-07145

EXAMINATION OF CLOSTRIDIUM BOTULINUM IN SAMPLES TAKEN FROM LAKE TOWADA,
Hirosaki Univ. (Japan). Faculty of Medicine.
For primary bibliographic entry see Field 05C.
W72-07163

MICROBIOLOGICAL PROCESSES IN LAKE MEKHTEB,
Dagestanskii Nauchno-Issledovatelskii Institut Selskogo Khozyaistva, Makhachkala (USSR). Dagestan Scientific-Research Institute of Agriculture, Makhachkala.
For primary bibliographic entry see Field 05C.
W72-07171

EXPLORATORY LIMNOLOGICAL STUDIES OF LAKE MANAPOURI, SOUTH ISLAND, NEW ZEALAND,
New Zealand Oceanographic Inst., Wellington.
J. Irwin.
N Z J Mar Freshwater Res. 5 (1): 164-177. 1971. Illus.
Identifiers: Exploratory, Island, Lake, Limnological, Manapouri, New-Zealand, Seasonal, South, Temperature.

Bathymetric and thermometric surveys of Lake Manapouri show that the greatest depth is 444 m and that the major portion of the lake occupies depths greater than 150 m. Stratification has developed by Jan., remains until June, and is followed by near isothermal conditions in late winter. The water temperature below 200 m is between 7.77 deg and 8.0 deg C throughout the year. The surface water temperature varies between 16.25 deg C in Jan.-March, and 8.0 deg C in Aug.-Sept. Tritium values suggest mixing has taken place to at least 400 m. Coarse sediments taken in 431 m indicate that the deep floor of the lake is not completely dominated by muddy sediments.--Copyright 1972, Biological Abstracts, Inc.
W72-07252

LIMNOLOGICAL CYCLES IN A PHOSPHATIC LIMESTONE MINE LAKE,
Florida Presbyterian Coll., St. Petersburg. Dept. of Mathematics and Natural Science.
For primary bibliographic entry see Field 05C.
W72-07253

VERTICAL DISTRIBUTION OF VENDACE COREGONUS ALBULA L. AND OTHER PELAGIC FISH SPECIES IN SOME POLISH LAKES,
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland).
W. Dembinski.
J Fish Biol. 3 (3): 341-357. 1971. Illus.
Identifiers: Alburnus-Alburnus, Coregonus-Albula, Distribution, Fish, Lakes, Osmerus-Eperlanus, Pelagic, Plankton, Polish, Species, Vendace, Vertical.

Studies on the vertical distribution of C. albula, smelt Osmerus eperlanus (L.) and bleak Alburnus alburnus (L.) in lakes have been carried out with the application of an echo sounder and then compared with control catches of fish and plankton. Methods and results have been discussed. Some remarks have been made on taking these species of fish.--Copyright 1972, Biological Abstracts, Inc.
W72-07254

A STUDY ON THE BALANCE OF CHLORINE OVER THE DRAINAGE AREA OF LAKE ONUMA IN OSHIMA PENINSULA, HOKKAIDO (IN JAPANESE),
Research Inst. for Natural Resources, Tokyo (Japan).
Tomoo Inoue, and Jishin Kobayashi.
Mis Rep Res Inst Nat Resour. 74. 65-71. 1970. Map. English summary.
Identifiers: Balance, Chlorine, Drainage, Hokkaido, Human, Japan, Lake, Onuma, Oshima, Peninsula, Rock, Soil.

An estimate is made on the amount of chlorine in Lake Onuma. It is calculated that chlorine from rocks, soils and human activity contribute to 1/7th of the total amount in the lake.--Copyright 1972, Biological Abstracts, Inc.
W72-07255

GENERAL HYDROBIOLOGY WITH PARTICULAR APPLICATION TO SCHISTOSOMA VECTORS. HYPEREUTROPHY, A MODERN PROBLEM OF BODIES OF WATER,
Instituto Oswaldo Cruz, Rio de Janeiro (Brazil).
For primary bibliographic entry see Field 05C.
W72-07256

COMPARATIVE PRODUCTION OF PIKE FINGERLINGS FROM ADULT SPAWNERS AND FROM FRY PLANTED IN A CONTROLLED SPAWNING MARSH,
Saskatchewan Fisheries Lab., Saskatoon.
L. M. Royer.
Progr Fish Cult. 33 (3): 153-155. 1971.
Identifiers: Adult, Comparative, Controlled, Fingerlings, Fry, Marsh, Pike, Planted, Production, Spawners, Spawning.

Northern pike fingerling production was studied over a 7-yr period in a controlled spawning marsh at Kenosee Lake, Saskatchewan. Production rates when adult spawners were stocked varied from 1038 to 1570 fingerlings per acre of marsh during 4 yr of operation. When hatchery reared fry were stocked in the marsh, fewer than 2 fingerlings per acre were produced during 2 yr of study. Data on the emigration of fingerlings are presented and possible factors responsible for the low survival of hatchery fry are discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-07276

2I. Water in Plants

CONTRIBUTION TO THE KNOWLEDGE OF ICELANDIC HOT SPRINGS,
Vienna Univ. (Austria). Zoologisches Institut.
Ferdinand Starmuehlner.
Sitzungsber Oesterr Akad Wiss Math Naturwiss Kl. 178 (5/8 (6)): 83-173. 1969. Illus. Maps.
Identifiers: Algae, Bacteria, Iceland, Invertebrates, Springs.

Qualitative and quantitative lists of invertebrates and algae species found in springs with temperatures ranging from 6 deg to 50 deg C are given. Above 50 deg C, only bacteria were found.--Copyright 1971, Biological Abstracts, Inc.
W72-06579

SOME BOTANICO-GEOGRAPHICAL FEATURES OF THE FLORA AND VEGETATION OF THE CHEPTSA RIVER FLOODPLAIN, (IN RUSSIAN),
S. I. Zarubin, V. V. Tuganaev, and M. P. Shilov.
Uch Zap Kirov Gos Pedagog Inst. 33. 79-84. 1969.
Identifiers: Affinities, Angiosperms, Boreal, Botanico, Cheptsa, Europena, Ferns-P, Floodplain, Flora, Geographical, Gymnosperms, Horsetails-P, Lycopodium-P, Mosses, River, Steppe, Taiga, USSR, Vegetation.

The basin of the Cheptsa River (a tributary of the Vyatka River), is located in the subzone of the southern taiga. Six hundred and ten species of plants were found on the Sheptsa River floodplain, of which 60 ssp. were mosses, 6 horsetails, 4 Lycopodium, 9 ferns, 6 gymnosperms, and 525 angiosperms; along the middle and lower reaches of the river conditions were more alluvial and flooded. The relative participation of the Boreal species was higher in the floodplain flora of the lower reaches than in that of the river as a whole or that of individual sections. Steppe species were more widely represented on the floodplain of the upper reaches; so were weeds. With movement from the mouth toward the source, from west to east, there was a noticeable decrease in the relative number of central European species. Large meadows are concentrated in the floodplain. Hydrophilic associations are usual on the meadows of the lower level of the streamside floodplain. The meadows of the intermediate level have better fodder.--Copyright 1971, Biological Abstracts, Inc.
W72-06582

WATER REGIME OF BUDS OF SOME TREE SPECIES, (IN RUSSIAN),
Y. A. Davydova.
Lesovedenie. 4. 32-44. 1969. (Engl. summ.).
Identifiers: Air, Buds, Development, Force, Growth, Moisture, Regime, Species, Suction, Temperature, Tree.

The moisture content and suction force in buds and growing points of birch, maple, oak, ash, elder and 8 other species throughout 1 yr were studied in order to evaluate the effect of internal and external factors. The water regime depends on internal factors, closely correlated with the processes of growth and development. Of the external factors the air temperature of the preceding period was found to exert great influence on the moisture content. However, the differences in the dependence of the water regime on air temperature in spring and in fall (with the same temperature range) indicate the leading role of the internal factors.--Copyright 1971, Biological Abstracts, Inc.
W72-06683

RESPONSE OF BEAN PLANTS TO SODIUM CHLORIDE AND SODIUM SULPHATE SALINIZATION,
Volcani Inst. of Agricultural Research, Rehovoth (Israel); and Hebrew Univ., Jerusalem (Israel).
For primary bibliographic entry see Field 03C.
W72-06701

THE COMPARATIVE WATER ECONOMY OF REPRESENTATIVE EVERGREEN SCLEROPHYLL AND DROUGHT DECIDUOUS SHRUBS OF CHILE,
Stanford Univ., Calif. Dept. of Biological Sciences; and Universidad Catolica de Chile, Santiago. Laboratorio de Botanica.
H. A. Monoey, and J. Kummerow.
Botantical Gazette, Vol. 132, No. 3, p. 245-252, 1971. 5 fig, 2 tab, 8 ref.

Descriptors: *Chaparral, *Plant morphology, *Leaves, *Ecological distribution, *Soil-water-plant relationships, Stomata, Drought resistance, Drought tolerance, Deciduous trees, Seminarid climates, Mode of action, Environmental effects, Water balance, Moisture stress, Water loss, Water conservation.
Identifiers: *Chile, Evergreens, *Sclerophyllous leaves.

In the central region of Chile, and altitudinal vegetation gradient in chaparral is divided into evergreen, sclerophyllous scrub species at higher, wetter elevations and drought deciduous and succulent species at lower, drier elevations. In an effort to study comparative drought responses of representative species of the morphological types, a region was chosen where the types overlap. Studied were 2 evergreen species, Lithraea caustica and Kageneckia oblonga, and 2 drought deciduous species, Proustia cinerea and Flourensia thurifera. Leaf morphological studies of the evergreen schlerophylls revealed thick cuticles and dense palisade cells. Porometer cup studies during a drought showed relatively high rates of water loss early and later marked decreases in water losses. Both drought deciduous species demonstrated gradual decreases in leaf area during the drought. No stomatal regulation of water loss occurred in Proustia prior to abscission. Flourensia did demonstrate stomatal control and gradual leaf drying-up rather than abscission. The stomatal control was triggered earlier than the decreased water loss in the sclerophylls. The overlap suggests that the study area is in the region where the benefits derived from year-round photosynthesis are offset by the energy costs of maintenance of evergreen schlerophylls. (Casey-Arizona)
W72-06702

VARIATION OF ALBEDO OF SELECTED SAGEBRUSH RANGE IN THE INTERMOUNTAIN REGION,
Utah State Univ., Logan. Dept. of Solids and Meteorology; and Idaho Univ., Moscow. Coll. of Forestry.
I. Dirmhirn, and G. H. Belt.
Agricultural Meteorology, Vol. 9, No. 1-2, p. 51-61, November 1961. 5 fig, 2 tab, 9 ref.

Descriptors: *Albedo, *Solar radiation, *Arid lands, *Vegetation effects, *Soil types, Idaho, On-site data collections, Energy budget, Environmental effects.
Identifiers: *Pyranometers.

Absorbed solar energy provides most of the energy for evapotranspiration, convection and soil heating. The amount absorbed is dependent upon the percentage reflected, or albedo. Albedo is a function of solar angle and the physical structure and spectral properties of the reflecting surface. Three Idaho sagebrush sites were selected for study, the albedo of each site was measured and efforts were made to evaluate sources of variation in the measurements. Albedo values were 13.1% from a low sagebrush site, 13.4% from a big sagebrush site and 18% from a big sagebrush and cheatgrass site. Vegetation distribution was measured and this was correlated with albedo differences. The unexpected uniformity in albedo on these sites suggested that although albedos of the sites varied with time of day (solar angle), soil type and vegetation type, the site differences between each component were relatively small. The uniformity of values suggest that albedos of these magnitudes should be applicable to a wide range of cold desert sites. (Casey-Arizona)
W72-06706

PHENOLOGY, COMMUNITY COMPOSITION, AND SOIL MOISTURE IN A RELICT AT AUSTIN, TEXAS,
Saint Edward's Univ., Austin, Tex.
For primary bibliographic entry see Field 04A.
W72-06710

MONTHLY VARIATION IN THE CHEMICAL COMPOSITION OF DESERT SALTBUSH,
California Univ., Riverside. Dept. of Agronomy; and California Univ., Riverside. Agricultural Extension Service.
N. J. Chatterton.
Journal of Range Management, Vol 24, No 1, p. 37-40, 1971. 2 fig, 15 ref.

Descriptors: *Variability, *Chemical analysis, *Chemical properties, *Desert plants, *Plant growth regulators, Arid lands, Southwest U.S., Forages, Food and cover crops, Cattle, California, Proteins, Calcium, Phosphorus, Fibers (Plants), Digestion, Nutrients, Nutrient requirements, Grazing.
Identifiers: *Desert saltbush, *Atriplex, *Nutritional value, Evergreen, Fat, Plant ash, Nitrogen free extract, Total digestible nutrients.

Desert saltbush (Atriplex polycarpa) is an evergreen shrub native to southwestern deserts. Saltbush is often the only food source available to cattle when annual plants are dormant. The nutritive value of Atriplex was studied on a southern California range to elucidate variations in chemical composition and forage suitability. Forage samples were analyzed for protein, fat, calcium, phosphorus, fiber, total ash and nitrogen free extract. Total digestible nutrients were calculated. Nutritional requirements of grazing animals were generally satisfied, though there was considerable forage-value variation throughout the year. Desert saltbush can serve as a dietary supplement and provide important nutritional components. Figures show monthly temperature, precipitation and soil moisture, and monthly variations in chemical constituents of desert saltbush. (Popkin-Arizona)
W72-06713

EFFECT OF PALOVERDE (CERCIDIUM) TREES ON THE RADIATION FLUX AT GROUND LEVEL IN THE SONORAN DESERT IN WINTER,
Arizona Univ., Tucson. Dept. of Biological Sciences.
C. H. Lowe, and D. S. Hinds.
Ecology, Vol. 52, No. 5, p. 916-922, 1971. 1 fig, 2 tab, 22 ref.

Descriptors: *Heat budget, *Microenvironment, *Arid lands, *Climatic data, *Physiological ecology, Animal physiology, Trees, Microclimatology, Solar radiation, Temperature, Evaporation, Arizona, On-site data collections, Metabolism.
Identifiers: *Net radiation, *Sonoran Desert.

Sonoran Desert tree species, including paloverdes, are thought to be important in the thermoregulatory ecology of many small and large homoiotherms. This is accomplished by modifying macroclimatic conditions. Solar and net radiation, temperature profiles and humidity were measured or calculated in the vicinity of a blue paloverde (Cercidium floridum) in the day and night during the winter solstice. Net income radiation at midday is more than twice than on open ground than under the paloverde, and the net outgoing radiation at night is in the same ratio. Using a model for the energy budget of 1-kg hypothetical homoiotherm, animal heat loss was calculated using the climatic data obtained in the paloverde and open ground measurements. It was found that the paloverde significantly modified the animals' heat loss, regardless of effective body-surface temperature. For an effective surface temperature of 7 degrees c, the animal will lose 2.6 times more heat at night in the open than under the paloverde and increases its metabolic rate by 2.6 times in order to balance heat loss. On open ground it would have to increase its metabolic rate by 6.2 times. The model also predicts that homoiotherms much smaller than 1 kg or poikilotherms could not survive on the desert surface under such conditions. (Casey-Arizona)
W72-06718

EFFECT OF SALINITY ON GROWTH OF A SALT MARSH GRASS,
Scripps Institution of Oceanography, La Jolla, Calif.
C. F. Phleger.
Ecology, Vol 52, No 5, p 908-911, 1971. 3 fig, 13 ref.

Descriptors: *Grasses, *Halophytes, *Salt tolerance, *Salt marshes, Competition, Saline waters, Environmental effects, Laboratory tests, Sodium, Potassium.

The salt marsh grass, Spartina folisoa, is a dominant plant in salt marshes growing in the San Diego area. The salt tolerance of this marine halophyte was tested using 6 different sea water concentrations ranging from 0% - 125% in nutrient solution (100% sea water concentration was 33%). Both plant survival and growth rates were highest in fresh water, decreasing with increasing salt concentrations. Fresh water grown plants contained the least Na (0.25%) and the most K (3.52%). The situation was reversed in salt water grown plants. The marsh grass was probably originally a fresh water plant that migrated into salt water due to competition pressures in the less saline environments and was forced to evolve salt-tolerance mechanisms. It is suggested that this grass may make good cattle fodder. (Casey-Arizona)
W72-06719

COMPETITION AND THERMOREGULATORY BEHAVIOR OF THE NAMIB DESERT TENEBRIONID BEETLE GENUS CARDIOSIS,
California Univ., Davis. Dept. of Zoology.
W. J. Hamilton, III.
Ecology, Vol 52, No 5, p 810-822, 1971. 9 fig, 1 tab, 6 ref.

Descriptors: *Xerophilic animals, *Arid lands, *Animal behavior, *Microenvironment, Temperature, Humidity, Mode of action, Environmental effects, Solar radiation, Microclimatology, Diurnal, On-site investigations, Insects, Ecological distribution, Animal populations, Physiological ecology.
Identifiers: *Behavioral thermoregulation.

The Cardiosis genus of Tenebrionid beetles is widespread in the Namib Desert, but only 2 species are sympatric (C. hamiltonuli and C. fairmairei) and even these species inhabit different habitats within their range. The species are confined to the drier, sandier areas and have not invaded the oases. All species are diurnal and respond to rapid changes in macro- and microclimatic conditions. Activity patterns were observed and correlated with climatic parameters--solar radiation, humidity, ambient temperature and soil temperatures from the surface to 20 cm. On usual warm days, activity patterns are diurnal, reaching peaks in the late morning and afternoon. On cool days, unimodal patterns prevail. It is felt that these animals are 'maxitherms' or animals who exploit favorable environmental conditions in order to maintain themselves within an optimal temperature range which is 37.5-40 degrees C. in the case of the Cardiosis genera. Behavioral thermoregulation ensures activity patterns which facilitate this end, regardless of parameters such as humidity. It is felt that the extreme limiting microclimatic conditions these animals are subject to may be a result of their extraordinary diversification. (Casey-Arizona)
W72-06724

ENERGY EXCHANGE IN PLANT CANOPIES,
Washington Univ., St. Louis, Mo. Dept. of Biology; and Missouri Botanical Garden, St. Louis.
R. G. Alderfer, and D. M. Gates.
Ecology, Vol 52, No 5, p 855-861, 1971. 4 fig, 2 tab, 20 ref.

Descriptors: *Energy budget, *Thermal radiation, *Estimating equations, *Leaves, *Canopy, Transpiration, Evaporation, Temperature, Radiation, Plant morphology, Air temperature, Physiological ecology, Environmental effects, Solar radiation, Infrared radiation.
Identifiers: *Radiation flux densities, *Plant canopies.

Variations in plant canopy microenvironment were investigated. Analytical methods for calculating these variations are described. The short-wave radiation at a given point in a canopy is determined entirely by the initial unattenuated flux above the canopy and by the absorbing and scattering properties of the canopy elements. The distribution of short-wave radiation within a canopy is described by a pair of modified Kubelka-Munk equations utilizing coefficients of absorption and scatter. General solutions are obtained and in order to calculate specific solutions, it is necessary to have values for the optical properties of absorption and scatter, the leaf-area index of the entire canopy, background reflectance and cumulative leaf area index. Understanding thermal radiation distribution in a canopy requires knowledge of short-wave radiation and temperature distributions within the canopy. A general energy budget equation for each canopy level is written and then computer-solved, n times for n layers, giving leaf temperature values at each level. Experimentally, energy flow description within plant canopies requires values for radiation flux densities, air temperature, leaf temperature, leaf optical properties and leaf area. These data were found for potted sunflower and cotton plants and experimental data were compared with calculated values. (Casey-Arizona)
W72-06725

NONSTOMATAL INHIBITION OF PHOTOSYNTHESIS IN SUNFLOWER AT LOW LEAF WATER POTENTIALS AND HIGH LIGHT INTENSITIES,
Illinois Univ., Urbana. Dept. of Botany.
J. S. Boyer.

Plant Physiology, Vol 48, No 3, p 532-536, October 1971. 6 fig, 20 ref.

Descriptors: *Photosynthesis, *Moisture stress, *Carbon dioxide, *Stomata, *Light intensity, Air temperature, Leaves, Metabolism, Laboratory tests, Plant physiology, Resistances.
Identifiers: *Plant water potentials, *Leaf diffusive resistance.

In higher plants, decreasing leaf water potentials are followed ultimately by decreasing rates of photosynthesis, which are usually attributed to stomatal closure. Recent studies have suggested that photosynthetic rates are decreased during periods of water stress. This work is an attempt to compare the effects of stomatal closure and chloroplast activity on photosynthetic response to low leaf water potentials. Sunflower (Helianthus annuus) plants were in soil in a constant environment chamber. Various leaf water potentials were produced by witholding water from the soil for as long as 4 days. When leaf water potentials were less than -12 bars, rates of photosynthesis at high light intensities were insensitive to external concentrations of carbon dioxide between 200-400 microliters/liter and to leaf temperatures between 10-30 degrees C. Leaf diffusive resistances were not so affected. This indicated that photosynthetic levels were not limited by either carbon dioxide diffusion or by some temperature-sensitive photosynthetic enzyme. Evidently photosynthetic rates are curtailed by low plant water potentials, even under high light intensities. (Casey-Arizona)
W72-06726

KINETICS OF THE SUBSTRATE FOR THE EVOLUTION OF CARBON DIOXIDE IN LIGHT BY PHOTOSYNTHESIZING ORGANS,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany; and Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Agronomy.
Y. B. Samish.
Journal of Theoretical Botany, Vol 33, No 3, p 557-564, 1971. 1 fig, 11 ref.

Descriptors: *Photosynthesis, *Respiration, *Carbon dioxide, *Stomata, *Resistances, Kinetics, Chemical properties, Plant physiology, Metabolism, Turnovers.

Carbon dioxide released by photosynthesizing organs in the light is considered to have been the product of photorespiration. The process of photorespiration plays a role in plant productivity, although the magnitude of the event relative to other processes is unknown and it should therefore be measured. Such measurements have been performed using labelled carbon dioxide in ambient air and determining the extent of its dilution by the release of unlabelled carbon dioxide from photorespiration. The method is based on the assumption that there is a period of time, which is at least as long as the experiment, in which carbon dioxide taken up by the plant has not yet been released by the photorespiration process. In investigating the kinetics of the process, it is necessary to estimate the effect of the resistances to carbon dioxide flow into the stomatal cavity and to consider the amount of carbon dioxide recycling taking place via photosynthesis-photorespiration as associated with the substomatal cavity. Analysis shows that there is an over-estimation of turnover time due to neglecting resistances to carbon dioxide exchange which are common to both the photosynthesis and photorespiration pathways. Since it is not possible to measure intratissue or intracellular exchange resistances, exact calculations of photorespiration turnover time is not yet possible. (Casey-Arizona)
W72-06727

STUDIES ON THE ARTHROPODS AND MICROORGANISMS OF SOME LIBYAN SOILS: SOIL ARTHROPODS AND MICROORGANISMS FROM UNDER FOUR FRUIT TREES,
Libya Univ., Tripoli. Faculty of Agriculture; and Libya Univ., Tripoli. Faculty of Science.
For primary bibliographic entry see Field 02G.
W72-06733

AN ECOLOGICAL STUDY OF WATER-FILLED TREE-HOLES AND THEIR POSITION IN THE WOODLAND ECOSYSTEM,
British Columbia Univ., Vancouver. Inst. of Animal Resources and Ecology.
R. L. Kitching.
J Anim Ecol. 40 (2): 281-302. 1971. Illus.
Identifiers: Beach-D, Ecological, Ecosystem, Fauna, Filled, Holes, Insect, Review, Tree, Woodland.

The ecology of water-filled tree-holes in beech trees in Wytham Woods, Berkshire, was studied and some results are presented. A review of work and observations on similar aquatic habits associated with plants is included. The position of water-filled tree-holes and associated insect fauna (5 Diptera and 1 bettle) in the woodland ecosystem is considered.--Copyright 1971, Biological Abstracts, Inc.
W72-06734

THE ENERGY BUDGET AT THE EARTH'S SURFACE: WATER RELATIONS AND STOMATAL RESPONSE IN A CORN FIELD,
Agricultural Research Service, Ithaca, N.Y. Soil and Water Conservation Research Div.
R. W. Shawcroft.
Available from NTIS, Springfield, Va. 22151 as AD-733 286, $3.00 paper copy, $0.95 microfiche. Army Electronics Command Research and Development Technical Report ECOM 2-68-1-7, January 1971. 94 p, 36 fig, 9 tab, 79 ref. Task 17 IT061102B53A, Cross Service Order 2-68.

Descriptors: *Soil-water-plant relationships, *Energy budget, *Corn (Field), *Leaves, *Stomata, Water balance, Hydrologic cycle, Crops, Respiration, Model studies, Stress, Agriculture, Analytical techniques, Soil moisture, Light intensity.
Identifiers: Stomatal resistance, Water stress, Soil moisture tension, Leaf resistance.

A study of plant-soil-water relationships describes the effects of light intensity and water stress on stomatal behavior under field conditions. A simple model was developed as a means of systematically approaching the problem. The model is based on measurements of leaf resistance and relative water content through the day for a range of different stress conditions. The results of the model indicate that after-effects of stress must be considered and that a more complete model must include the effects of internal CO2 concentration. Testing of the changes in stomatal resistance in response to changes in leaf water relations shows how the effects of water stress can be included as a submodel in the larger plant community model. The agreement between the energy balance measurements and the model calculations using the measured resistances strengthens the confidence in the approach. Comparison of the total flux values for the crop appears to be a good test of the model and illustrates how small differences in profiles can influence the overall exchange processes. (Woodard-USGS)
W72-06791

ADAPTATION OF GROWTH FORM IN ECHIUM LEUCOPHAEUM (BORAGINACEAE),
Goucher Coll., Baltimore, Md.
Kornelius Lems, and Christina M. Holzapfel.
Ecology. 52 (3): 499-506. 1971. Illus.
Identifiers: Adaptation, Boraginaceae-D, Branches, Canary, Echium-Leucophaeum-D, Ecotypes, Evaporation, Form, Growth, Height, Islands, Lateral, Periodicity, Rainfall, Temperature, Wind.

Ecotype, formation in 8 populations of Echium leucophaeum was studied on La Palma (Canary Islands) at 100-m intervals from sea level to 600 m elevation. Climate varied with altitude, the lower elevation having higher temperatures, evaporation, and wind velocity and lower rainfall. A method for recording growth form of individual plants was developed whereby lateral branch production and branching patterns of woody plants would readily be determined. Height growth, lateral branch production, periodicity, and number of branching cycles of Echium were all found significantly different in the field, plants from higher elevations having longer branches, more laterals per cycle, fewer cycles, and retarded flowering and fruiting compared with plants near sea level. Two generations of seedlings of the extreme types grown in transplant gardens showed significant differences in inherent rate of growth, indicating genetic adaptation of high and low altitude ecotypes. No significant differences could be shown in the rate of lateral branch formation and periodicity; differences observed in the field with respect to these characteristics may be physiological responses.--Copyright 1971, Biological Abstracts, Inc.
W72-06865

ESTIMATES OF WATER LOSS AND ITS RELATION TO ENVIRONMENTAL PARAMETERS IN DOUGLAS-FIR SAPLINGS,
Washington, Univ., Seattle. Coll. of Forest Resources.
Thomas M. Hinckley, and R. M. David.
Ecology. 52 (3): 520-524. 1971. Illus.
Identifiers: Crown, Douglas-Fir-G, Environment Environmental, Light, Loss, Micro, Parameters Pressure, Pseudotsuga-Menziesii-G, Relation Sap, Saplings, Temperature, Xylem.

Water use by plantation Douglas-fir (Pseudotsug menziesii (Mirb.) Franco) cannot always be pr dicted from environmental parameters. Und conditions of low soil-water content, no significa correlations were found between solar radiation o air temperature, or both, and sap flow. However, highly significant correlations were observed after soil-moisture recharge had occured. Zones of xylem sap pressure and relative stomatal apertures were found within the crowns of 6-m high trees. Vertical zones of xylem sap pressure seemed to be controlled by differential stomatal closure which, in some cases, acted independently of crown microenvironment. However, differences in xylem sap pressures between the north and south sides of the trees could readily be explained by differences in microenvironment.--Copyright 1971, Biological Abstracts, Inc.
W72-06888

WORLD VEGETATION TYPES.

Columbia University Press, New York, N. Y., 1971. Eyre, S. R. (Edited by). 264 p.
Identifiers: Asian, Book, Coniferous, Deserts, Forest, Grassland, Sclerophyllous, Scrub, Types, Vegetation, World.

This anthology comprises 21 extracts from the works of authorities on the main vegetation types of the earth. Prominence is given to certain plant communities because particular problems exist regarding their ecological status or regeneration processes; consequently there are as many as 6 contributions dealing with mid-latitude grasslands but only one on coniferous forests. The concept of convergent evolution is another fundamental topic in vegetation studies, and, since this is illustrated well by the sclerophyllous scrub formations in the mid-latitude areas of winter rain and summer drought, 4 passages dealing with this type of community are included. An introduction outlines the field of knowledge covered, justifies the choice of material and focuses attention on the salient and significant problems in vegetation study. The anthology also contains 3 translations, one on the deserts of Central Asia recently translated from the Russian and 2 translations from French. The book contains 8 pages of half-tone illustrations and is concluded by a selected bibliography.--Copyright 1971, Biological Abstracts, Inc.
W72-06944

A CONTRIBUTION TO THE LIVERWORT FLORA OF THE LUBLIN REGION, (IN POLISH),
Marie Curie-Sklodowska Univ., Lublin (Poland). Nauk Ziemi.
Kazimierz Karczmarz.
Ann Univ Mariae Curie Curie-Sklodowska Sec C Biol. 25: 81-104. 1970. (English summary).
Identifiers: Associations, Cephalozia-Leucantha, Flora, Habitats, Liverwort, Lublin, Poland, Records, Riccardia-Incurvata, Riccia-Bifurca, Riccia-Canaliculata, Riccia-Rubenariana.

The ecological characteristics of habitats and the detailed distribution of species were given. Six maintypes of ecological habitats were distinguished for liverworts: chalk, loesses, Miocene Lithothamnion limestone, redzinas, clays and sands, water reservoirs, springs and peat bogs, tree trunks. Main indicator species were presented for these habitats. The associations and epiphytic communities of liverworts with mosses are poorly developed because of the destruction and young age of forests. Often, there are only the associations and communities in which species are very common and easily reproduce sexually or propagate vegetatively. Frequently occurring associations are: Lophocoleetum heterophyllae and Ptilidietum pulcherrimae. Only one typical community was found, Frullania dilatata -- Radula complanata. The first association and community develop on trunks of deciduous trees and the second on the trunks of pines. Among the liverworts, these rare species are new for the Lublin area: Cephalozia leucantha, Riccardia incurvata, Riccia bifurca, R. Canaliculata and R. hubenariana.--Copyright 1971, Biological Abstracts, Inc.
W72-06981

EVERGREEN WATERCRESS GROWTHS. A SPECIAL GROUP OF HYDROPHILOUS VEGETATION,
P. K. Khalkuziev.
Uzb Biol Zh. 14 (3): 37-39. 1970 (English summary).
Identifiers: Cattail-M, Cress-D, Evergreen, Group, Growths, Hydrophilous, Juncus-M, Macrophytes, USSR, Vegetation.

Evergreen watercress communities, particularly those of the Shakhimardan river basin are described. Watercress gradually displaces cattail and Juncus.--Copyright 1971, Biological Abstracts, Inc.
W72-06983

DETERMINATION OF THE SOUTHERN LIMIT OF THE INFLUENCE OF THE MARINE BREEZE. ITS ACTION ON THE DISTRIBUTION OF ORANIAN VEGETATION,
Algiers Univ. (Algeria). Faculty of Science.
C. Alcaraz.
Bull Soc Hist Natur Afr Nord. 61 (1/2): 87-94. 1970.
Identifiers: Breeze, Chamaerops-Humilis-M, Determination, Distribution, Marine, Oak-D, Oranian, Pinus-Halepensis-G, Southern, Thuja-G, Vegetation.

The ocean breeze effect can be measured farther south in Oran than in Algeria, because of the lack of a high coastal mountain range. The southern limit of influence of the ocean breeze corresponds with the position of the relative humidity line of 29% in July and Aug. This corresponds to the southern limit of Thuja and of dwarf palm (Chamaerops humilis L.), Pinus halepensis and live oak, although Thuja extends its range closer to the coast.--Copyright 1971, Biological Abstracts, Inc.
W72-06995

MEASUREMENT OF PLANT COMMUNITY COVER FROM AERIAL PHOTOGRAPHS USING EKTACHROME INFRARED AERO FILM,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 07B.
W72-07006

CONTRIBUTION TO KNOWLEDGE ABOUT THE OLIGOCHAETE FAUNA OF THE THERMAL WATERS NEAR ORADEA (IN RUMANIAN),
Babes-Bolyai Univ., Cluj (Rumania).
Victor Pop.
Stud Univ Babes-Bolyai Ser Biol. 16 (1): 127-132. 1971. Illus. Russian and French summaries.
Identifiers: Fauna, List, Nais-Bihorensis, Oligochaete, Oradea, Romania, Species, Thermal.

A list is given of the 26 spp. of oligochaetes found in the thermal waters near Oradea in the department of Bihor, Romania. Nais bihorensis is described as a new species. N. bihorensis is most similar to N. josinae Vejdovsky and P. blanci (Piguet), but has several specific characteristics differentiating it from them. The worm can be found on submerged plants and on mud bottoms in freshwater.--Copyright 1971, Biological Abstracts, Inc.
W72-07035

THE EFFECT OF SODIUM CHLORIDE ON SOME PHYSIOLOGICAL GROUPS OF MICROORGANISMS INHABITING A HIGHLY SALINE SOIL,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture; and Hebrew Univ., Rehovoth (Israel). Dept. of Phytopathology and Microbiology.
P. Keller, and Y. Henis.
Israel Journal of Agricultural Research, Vol. 20, No. 2, p 71-75, 1970. 2 tab, 15 ref.

Descriptors: *Arid lands, *Saline soils, *Microorganisms, *Soil environment, *Environmental effects, Microenvironment, Microflora, Aerobic bacteria, Anaerobic bacteria, Nitrogen fixing bacteria, Soil bacteria, Yeasts, Habitats, Sulfur bacteria.
Identifiers: *Negev Desert, *Hydrohalomorphic soils, *Decomposers.

Most ecological studies on the microfloras of saline environments deal with microorganisms in watery habitats. Much less is known about the microbial populations of natural saline soils or the effect of salts on microbial activities in non-saline soils. A highly saline hydrohalomorphic soil near Eilat and a non-saline sandy-loam soil from Rehovot were examined for bacterial nitrate reducers, sulfate reducers, aerobic nitrogen fixers, anaerobic N fixers, ammonia oxidizers, sulfur oxidizers, aerobic cellulose decomposers and anaerobic cellulose decomposers. Both were Negev Desert soils. The saline soil was found to contain cellulose decomposers, nitrate reducers and anaerobic N fixers in the 0-50 cm depth. Salt dependent amoebae were found in the upper 10 cm. Aerobic cellulose decomposers depended on salts while nitrate reducers were merely tolerant, especially of NaCl. Bacterial groups inhabiting saline soils were generally more salt-tolerant than those inhabiting non-saline soils. (Casey-Arizona)
W72-07036

PHENOLOGY OF SALT DESERT PLANTS NEAR CONTOUR FURROWS,
Utah State Univ., Logan. Dept. of Range Science.
For primary bibliographic entry see Field 04A.
W72-07037

THE EFFECT OF SOIL WATER AND AERATION ON SEED GERMINATION,
Volcani Inst. of Agricultural Research, Bet Dagan (Israel).
S. Dasberg, and K. Mendel.
Journal of Experimental Botany, Vol 22, No 73, p 992-998, November 1971. 5 fig, 17 ref.

Descriptors: *Soil water movement, *Germination, *Moisture stress, *Hydraulic conductivity, Aeration, Soil texture, Plant growth, Laboratory tests, Seeds, Soil types, Water supply.
Identifiers: *Soil matric potential.

Soil matric potential influences seed germination not only by its effect on water availability, but also by means of the hydraulic conductivity and by its effect on the seed-water contact. In the wet range, matric potential may affect oxygen supply to the germinating seed. An attempt was made to evaluate the relative importance of these factors on germination of Oryzopsis holciformis and wheat (Triticum aestivum). Soil texture proved important. The optimum matric potential for germination was -0.005 bar in coarse sand and -0.5 bar in sandy loam. This was due to differences in the rate of water supply to the seed as a function of area of contact between seed and soil and the soil hydraulic conductivity. At higher soil water potentials (higher soil water content) germination was decreased; this was because soil aeration was inadequate. (Casey-Arizona)
W72-07041

DROUGHT RELATIONSHIPS AND DISTRIBUTION OF TWO MEDITERRANEAN-CLIMATE CALIFORNIA PLANT COMMUNITIES,
Stanford Univ., Calif. Dept. of Biological Sciences.
A. T. Harrison, E. Small and H. A. Mooney.
Ecology, Vol 52, No 5, p 869-875, Late Summer 1971. 5 fig, 2 tab, 14 ref.

Descriptors: *Chapparel, *Xerophytes, *Soil-water-plant relationships, *Physiological ecology, *Environmental effects, Plant physiology, Leaves, Photosynthesis, Transpiration, Mode of action, Drought tolerance, Water balance, On-site investigations, California, Shrubs, Biological communities, Ecological distribution, Plant root systems, Plant morphology.
Identifiers: *Drought evasion, *Leaf sclerophylly.

The lower and intermediate elevations of the coastal mountain regions of southern California are dominated by 2 types of plant communities. The lower regions, up to about 300 m, are dominated by coastal sage, composed of shallow-rooted drought deciduous subshrubs, having soft mesomorphic leaves. At the higher elevations are the deeply and extensively rooted evergreen sclerophyllous shrubs constituting the coastal chaparral. Measurements of photosynthesis and transpiration were undertaken on the leaves of field collected specimens of both communities. Initial values were recorded and the plants were then subjected to artificial drying, during which these parameters were continually monitored. Fully hydrated coastal sage species leaves maintained initially high photosynthesis and transpiration, which subsequently declined, on drying, to zero photosynthesis and 25% of maximum rate transpiration. Chaparral species initial photosynthesis and transpiration rates were only 25-30% the initial rates of the coastal sage species, but declined far more slowly and never reached zero. These responses are considered reflections of the ecological limiting factors of the 2 communities. The coastal sage species experience rapid growth, flowering and fruiting during suitably wet periods, followed by leaf loss. The chaparral group is less sensitive to climatic change and maintains year-round physiological continuity. (Casey-Arizona)
W72-07047

THE LETHAL DECLINE OF MESQUITE ON THE CASA GRANDE NATIONAL MONUMENT,
Arizona State Univ., Tempe. Div. of Agriculture.
B. I. Judd, J. M. Laughlin, H. R. Guenther, and R. Handegarde.
Great Basin Naturalist, Vol 31, No 3, p 153-159, September 1971. 4 fig, 6 ref.

Descriptors: *Trees, *Mesquite, *Arid lands, *Xerophytes, *Arizona, Water table, Parasitism, Plant populations, Droughts, Plant root systems, Climatic data, Groundwater, Rainfall.

Dead mesquite (Prosopis juliflora) trees are the rule throughout Casa Grande National Monument in central Arizona. In an endeavor to determine the year of death and age, 10 cross-sectional

specimens were cut from various mesquite trees on the monument. Three of them proved to be satisfactory dendrochronological material. Their ages were 110, 137 and 111 years. All 3 specimens exhibited series of good and bad growth years, but attempts to correlate these with precipitation data or to crossdate between trees proved ineffective. No evidence of infestation by insects or disease prior to death was discovered. Mistletoe infections may have been important, judging from photographs from 1878 and 1930; possibly they lowered the tree resistances enough to interfere with their capabilities to adapt to changing conditions. The only other factor which may be important is water table decline. The records of water table levels and mesquite deaths indicate correlations. Age of trees, insect infestation and natural successional processes may have been secondary factors. (Casey-Arizona)
W72-07051

SIMULTANEOUS MEASUREMENTS OF SOLUTION ABSORPTION, TRANSPIRATION, RELATIVE PLANT WATER CONTENT AND GROWTH,
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
D. G. Harris.
Agronomy Journal, Vol 63, No 6, p 840-844, November-December 1971. 3 fig, 27 ref.

Descriptors: *Instrumentation, *Laboratory tests, *Absorption, *Plant growth, *Transpiration, Cotton, Water balance, Soil-water-plant relationships.
Identifiers: *Plant water potential, *Relative plant water content.

It is generally agreed that plant water potential is the best available term for expressing plant water status. Methods for measuring it are relatively difficult and researchers have had to use indirect nondestructive techniques for continuous monitoring of changes in water potential. An automated system is described for frequently and accurately measuring nutrient solution absorption and changes in total green weight of large individual plants. From those 2 basic measurements, transpiration and relative plant water content (RPWC) may be calculated on a short-term basis. Growth may be calculated on a long-term (24-hour) basis. Measurements made on cotton plants are presented. Instantaneous measurements of the important RWPC give a resolution at least 10 times greater than that obtainable with other techniques. (Casey-Arizona)
W72-07052

RECYCLING THROUGH HIGHER PLANTS,
King's Coll., London (England). Dept. of Botany.
F. R. Whatley.
Proceedings of the Royal Society, London, B, Vol 179, No 3, p 193-200, 1971. 1 fig, 3 tab, 5 ref.

Descriptors: *Ecosystems, *Metabolism, Waste treatment, *Photosynthesis, *Cycles, Chemical properties, Plant physiology, Inorganic compounds, Organic compounds, Water circulation, Water requirements, Waste water treatment, Sewage treatment, Carbon dioxide, Oxygen, Planning.
Identifiers: *Waste recycling, *Assimilation quotient.

In terrestrial ecosystems, chemical energy is stored in carbohydrates and ATP by the activity of chloroplasts and solar radiation. Mitochondria in the same organism or somewhere down the food chain then oxidize the carbohydrate, releasing carbon dioxide and using oxygen. On Earth, this cycle forms a dynamic but stable equilibrium. If man attempts space exploration, it will be necessary for him to create in miniature a small part of this stable atmospheric system. Man's daily input includes 600 g food, 900 g oxygen and 1500 g of drinking water plus some extra water for sanitary purposes. His daily wastes, from which at least some of his input must be regenerated, involve 1000 g carbon dioxide, 400 g metabolic water, 1500 g liquid and solid waste excretions and 2000 g contaminated sanitary water. In fact, the efficiency of recycling waste products must be quite high for trips of any length. An inorganic system would involve water electrolysis, distillation and dialysis, among many possibilities. Such a process would continue until all the C of the system appeared as elemental. This disadvantage would not occur in a biological recycling system using plants, and devising methods to bring the plants' assimilatory quotient into balance with the humans' respiratory quotient. The problems in choosing optimal plants for a Martial greenhouse are analyzed. (Casey-Arizona)
W72-07054

STEM DIAMETER IN RELATION TO PLANT WATER STATUS,
Agricultural Research Service, Auburn, Ala. Soil and Water Conservation Research Div.
B. Klepper, V. D. Browning, and H. M. Taylor.
Plant Physiology, Vol. 48, No. 6, p. 683-685, December 1971. 4 fig, 7 ref.

Descriptors: *Plant growth, *Hysteresis, *Leaves, *Water balance, *Solar radiation, Cotton, Soil-water-plant relationships, Instrumentation, Canopy, Environmental effects, Diurnal.
Identifiers: *Net radiation, *Plant water potential, *Relative water content.

Continuous non-destructive measurements of plant water status are more useful than non-continuous measurements, particularly in view of the continuous diurnal changes related to both shoot and root environments. This work concerns the relationship of changes in cotton stem diameter determined with a linear variable differential transformer (LVDT) to plant water status. In addition to stem diameters, measurements were made of solar radiation, relative water and leaf water potential in cotton plants. All 3 plant variables were closely related to net solar radiation at the top of the plant canopy. Diurnal water potential patterns were consistently different between the east and west aspects of the plants. The differences were slight. There is a diurnal hysteresis between stem diameter and leaf water potential. Probably this monitoring method will be valid for long-term stem diameter growth. (Casey-Arizona)
W72-07063

EFFECT OF PRECIPITATION ON PINE INCREMENT, (IN RUSSIAN),
A. S. Liseev.
Lesovedenie. 4. 18-25. 1969. (Engl. summ.).
Identifiers: Increment, Pine-G, precipitation.

Formulas are given for the relation between pine increment and precipitation for the individual periods during 2 hydrological years in the Buzuluk pine forest and in the Moscow Region. The difference in the effect of precipitation on pine increment under conditions of sufficient humidity (the Moscow Region) is pointed out. The magnitudes of the coefficients of correlation between pine increment and the various environmental factors in themselves do not indicate the effect of the individual factors on the increment. The specific significance of these factors in the total complex of causes conditioning the increment must be known.--Copyright 1971, Biological Abstracts, Inc.
W72-07117

THE FAUNA ON AQUATIC VEGETATION IN THE INUNDATION REGION OF APATIN, (IN GERMAN),
Bioloski Institut, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 05C.
W72-07140

COMPARATIVE STUDY OF SPECIES NAUTOCOCCUS MAMMILATUS AND NAUTOCOCCUS PYRIFORMIS (TETRASPORALES),
Ceskoslovenska Akademie Ved, Trebon. Lab. of Algology.
For primary bibliographic entry see Field 05C.
W72-07141

2J. Erosion and Sedimentation

GEOMORPHOLOGICAL EVIDENCE OF FAULTING IN THE SOUTHERN ATACAMA DESERT, CHILE,
University Coll., London (England). Dept. of Geography; and Instituto de Investigaciones Geologicas, Santiago (Chile).
R. U. Cooke, and C. Mortimer.
Revue de Geomorphologie Dynamique, Vol 20, No 2, p 71-78, March-April 1971. 5 fig, 20 ref.

Descriptors: *Geomorphology, *Alluvial channels, *Landforming, *Terrain analysis, *Superimposed drainage, Topography, Deserts, Drainage density, Erosion, Geological surveys, Mountains, Structural geology, Valleys, Weathering, Arid lands, Faults (Geology).
Identifiers: *Chile, *Atacama Desert, *Tectonic activity.

Chilean topography is customarily divided into 3 north-south zones which are the Andes Mountains, the Longitudinal Valley and the Coast Ranges. It has been suggested that the zones coincide with tectonic units differentiated by movements along longitudinal structures, but this has been substantiated in only a few areas. In the southern Atacama Desert, the simple topographic tripartite division disappears. The Andes and Coast Ranges are continuous and the Longitudinal Valley is represented only by a few isolated alluvial basins. Topographic evolution here appears to have been influenced more by erosion associated with latitudinal rivers than by tectonic activity along longitudinal structures. Various alluvial landforms, pediments and drainage patterns of the southern Atacama Desert are examined and described. Fault movements are most clearly manifested in the alluvial basins where the smooth aggradational surfaces provide landmarks. Convincing morphological evidence is scarce and localized but present so that conclusions can be drawn concerning the type and age of the tectonic movements. The weight of evidence indicates that the region has not been entirely stable during the period of landform evolution and that the hypothesis concerning tectonic activity along longitudinal structures is substantiated. (Casey-Arizona)
W72-06728

INSTRUMENTATION AND MEASURING TECHNIQUES,
Geological Survey, Fort Collins, Colo.
C. F. Nordin, and E. V. Richardson.
In: River Mechanics, Volume 1; editor Hsieh Wen Shen, Colorado State University, p 14-1 - 14-38, 1971. 15 fig, 2 tab, 59 ref.

Descriptors: *Sediment transport, *Stream gages, *Water measurement, *Sampling, *Discharge measurement, Water quality, Surveys, Data collections, Runoff, Streamflow, Tracers, Dye releases, Instrumentation, Measurement, Channel morphology.

Some of the techniques and instrumentation for determining streamflow, discharge of solid and dissolved material, water quality, and properties of the channel are reviewed. Records of streamflow for rivers in Europe extend back to early in the 19th century, and reliable records of many United States streams date from about 1888, when the U. S. Geological Survey initiated its streamgaging program. Discharge cannot be measured directly, but stage can be recorded continuously to give a stage hydrograph. If a relation between stage and discharge, called a rating curve, can be

developed, the discharge hydrograph can be determined. Sedimenttsampling programs usually are designed to give the concentration of both fine and coarse fractions of the sediment load. Equipment and techniques for using radioactive tracers and for fluorescent tracers are discussed. Many methods have been devised for determining the time of travel and dispersion of a contaminant in a stream. These methods include analysis of hydrographs, timing floats, tracing chemical salts, radioactive tracers, and fluorescent dyes. Of these methods, fluorescent dyes appear to be the best. Many streams are sampled periodically or monitored continuously to determine water quality. River surveys determine the plan, profile, and cross-sectional properties of streams, the characteristics of the flow, of bed and bank materials, of transported sediments, and of water quality. (Knapp-USGS)
W72-06761

SUSPENDED LOAD,
Geological Survey, Fort Collins, Colo.
C. F. Nordin, and R. S. McQuivey.
In: River Mechanics, Volume 1; editor Hsieh Wen Shen, Colorado State University, p 12-1 - 12-31, 1971. 13 fig, 23 ref.

Descriptors: *Suspended load, *Sediment transport, Turbulent flow, Turbulence, Suspension, Hydraulics, Equations, Sampling, Sediment load.

Some of the theoretical and practical aspects of suspended sediment transport are reviewed and recent observations relating suspended sediment to turbulent characteristics of the flow are discussed. The theoretical basis for estimating suspended sediment loads in streams are the energy approach, or Velikanov's gravitation theory, and the diffusion theory. For steady uniform flow in a two-dimensional channel, the diffusion equation can be simplified. The standard approach then is to integrate the suspended load equation by assuming a logarithmic velocity distribution, a mass transfer coefficient equal to the momentum transfer coefficient, and a concentration at one point in the flow. Measurements of turbulence permit direct evaluation of the momentum -nsfer coefficients, and show that, in general, the coefficients do not go to zero at the water surface, as postulated in the conventional approach. (Knapp-USGS)
W72-06762

SOIL EROSION BY WATER ON UPLAND AREAS,
Agricultural Research Service, Lafayette, Ind.
L. D. Meyer.
In: River Mechanics, Volume 2; editor Hsieh Wen Shen, Colorado State University, p 27-1-27-25, 1971. 9 fig, 3 tab, 41 ref.

Descriptors: *Soil erosion, *Sedimentation, Erosion, Mathematical models, Degradation (Slope), Erosion control, Soil conservation.

Eroded soil is our Nation's largest pollutant of surface waters. A loss of only 0.01 inch of soil over an area of one square mile amounts to more than 1000 tons or about 1400 cubic yards of deposited sediment. Rates a hundred times this great or more may occur from long, bare slopes such as construction sites. The process of soil erosion may be simulated by a mathematical model. Various subprocesses such as (a) soil detachment by rainfall, (b) transport by rainfall, (c) detachment by runoff and (d) transport by runoff are considered as separate but interacting phases of the process. The dynamics of each subprocess may be evaluated from fundamental hydraulic, hydrologic, meteorologic, and other physical relationships, and soil properties. Soil erosion rates on cultivated land currently are predicted by evaluating the Universal Soil-Loss Equation. This methodical procedure, based on statistical analyses of thousands of plot-years of data from 47 locations in 24 states, estimates erosion rates for a wide range of rainfall, soil, slope, crop, and management conditions. (Knapp-USGS)
W72-06763

GREAT LAKES REGION INVENTORY REPORT: NATIONAL SHORELINE STUDY.
Corps of Engineers, Chicago, Ill. North Central Div.
For primary bibliographic entry see Field 08A.
W72-06767

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, DEEP SEA DRILLING PROJECT, LEG 7,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02K.
W72-06782

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, DEEP SEA DRILLING PROJECT, LEG 8,
Geological Survey, Woods Hole, Mass.; and Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02K.
W72-06783

MECHANICS OF SEDIMENT SUSPENSION DUE TO OSCILLATORY WATER WAVES,
Army Coastal Engineering Research Center, Washington, D.C.
M. M. Das.
In: Sedimentation, Symposium to Honor Professor H. A. Einstein, June 17-19, 1971, Berkeley, Calif; Hsieh Wen Shen, editor - Colorado State University, p 11-1 - 11-23, 1971. 9 fig, 1 tab, 18 ref.

Descriptors: *Suspended load, *Waves (Water), *Sediment transport, Surf, Currents (Water), Model studies, Hydraulic models, Diffusion, Flumes, Equipment, Ripple marks.

Turbulent boundary layer flow simulating the bottom motion due to oscillatory water waves was produced in a swing flume. The flume, freely suspended from the ceiling of the laboratory, can be oscillated by a driving mechanism. The semiamplitude and the period of oscillation and bottom velocity were varied from 0.5 to 1 foot, 2.35 to 5.88 secs, and 0.73 to 1.90 ft per sec respectively. Except very near the bottom, the vertical distribution of mean particle concentration may be described by power type relationships with reasonable experimental scatter. The vertical diffusion coefficient for the particles, computed from the mean concentration and its gradient, appears to be linearly related to the distance above the bottom, for the range of the conditions tested. (Knapp-USGS)
W72-06812

MATHEMATICAL MODELS FOR SEDIMENT SUSPENSION FROM A MOMENTUM DIFFUSION VIEWPOINT,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. C. Willis.
In: Sedimentation, Symposium to Honor Professor H. A. Einstein, June 17-19, 1971, Berkeley, Calif; Hsieh Wen Shen, editor - Colorado State University, p 9-1 - 9-22, 1971. 4 fig, 2 tab, 10 ref.

Descriptors: *Suspended load, *Mathematical models, *Sediment transport, Diffusion, Model studies, Shear stress, Velocity, Turbulence.

The diffusion of fluid momentum is more nearly analogous to the diffusion of sediment momentum than to the diffusion of sediment mass. Analyses of the vertical diffusion processes in a flow give models for the distribution of sediment momentum that have the same mathematical forms as models for the sediment mass or concentration distribution. These models predict essentially the same sediment momentum profiles within the body of the flow. The distribution forms are verified by experimental data. The integral over the flow depth gives a consistent estimate of the mean discharge concentration of sediment. The lower limit of integration of this model depends only on the parameters of the model. (Knapp-USGS)
W72-06813

BOUNDARY-LAYER FLOW STRUCTURE: EFFECTS ON DETACHMENT OF NONCOHESIVE PARTICLES,
Agricultural Research Service, Manhattan, Kans. Div. of Soil Erosion.
L. Lyles, and N. P. Woodruff.
In: Sedimentation, Symposium to Honor Professor H. A. Einstein, June 17-19, 1971, Berkeley, Calif; Hsieh Wen Shen, editor - Colorado State University, p 2-1 - 2-16, 1971. 6 fig, 4 tab, 22 ref.

Descriptors: *Erosion, *Sediment transport, *Turbulent flow, *Boundary layers, *Turbulence, Suspended load, Bed load, Hydraulics, Roughness (Hydraulic), Scour.
Identifiers: *Boundary layer turbulence.

In water, particles cannot be lifted from the bed without turbulent fluctuations adjacent to and directed toward the bed. Mean velocity cannot be used to characterize critical conditions for partical movement unless surfaces are similar. Turbulence intensity is influenced by size, shape, and arrangement of elements causing roughness in neutral flows. Vibratory motion of particles occurs before translation. Average particle-frequency vibration is related to the frequency band containing the maximum turbulent energy. Experimentally determined threshold-friction velocities for a given particle-size range were approximately equal regardless of turbulence intensity. (Knapp-USGS)
W72-06814

THE SPEEDS OF SAND GRAINS IN LAMINAR FLOW OVER A SMOOTH BED,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
D. A. Parsons.
In: Sedimentation, Symposium to Honor Professor H. A. Einstein, June 17-19, 1971, Berkeley, Calif; Hsieh Wen Shen, editor - Colorado State University, p 1-1 - 1-25, 1971. 9 fig, 5 tab, 9 ref.

Descriptors: *Bed load, *Sediment transport, *Laminar flow, Turbulent flow, Scour, Model studies, Hydraulic models, Suspended load, Particle size, Shear drag, Shear stress.

Rates of travel of several sizes of sand grains and glass beads in laminar sheet flow were measured at differing discharges and slopes over a smooth bed. Rolling and sliding particles in contact with the bed travelled half as fast as the velocity of the water in unobstructed flow at a distance from the bed equal to the radius of a sphere of equal volume. At high values of fluid shear at the bed the particles moved at greater speeds, suggesting that they were suspended in the moving fluid. Fluid shear stresses at the bed that are critical for minimum suspension and transport were derived and compared with published values of critical shear stresses for movement of bed materials. (Knapp-USGS)
W72-06815

A CORING DEVICE FOR UNCONSOLIDATED LAKE SEDIMENTS,
Federal Water Pollution Control Administration, Athens, Ga. Southeast Water Lab.
For primary bibliographic entry see Field 07B.
W72-06831

CHANNEL MOVEMENT OF MEANDERING INDIANA STREAMS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W72-06913

STABLE BED PROFILES IN CONTINUOUS BENDS,
California Univ., Berkeley. Dept. of Civil Engineering.
M. El-Khudairy.
Hydraulic Engineering Laboratory Technical Report HEL-6-31, October 1970. 103 p, 51 fig, 9 tab, 13 ref. OWRR A-023-CAL (3). Contract DACW05-71-C-0024.

Descriptors: *Channel morphology, *Sediment transport, *Alluvial channels, *Meanders, Sediment load, Bed load, Channel erosion, Geomorphology.
Identifiers: Channel stability.

The changes in bed profile induced by secondary flow at channel bends were investigated both theoretically and experimentally. Open channel flow at bends is complicated by the existence of secondary flows. With movable beds, change in the bed shape follows change in the secondary flow. Therefore, when investigating the bed load movement and the bed profile in curved open channels, it is necessary to determine the velocity distribution in the channel. The distribution of the average longitudinal velocity components over the width of the continuous channel bend follows a linear relationship. Only one secondary current was observed across the whole width of the channel for each experiment conducted. (Knapp-USGS)
W72-06916

GUIDEBOOK FOR THE 36TH ANNUAL FIELD CONFERENCE OF PENNSYLVANIA GEOLOGISTS.

Proceedings of 36th Annual Field Conference of Pennsylvania Geologists, October 8-9, 1971, Wilkes-Barre; distributed by Pennsylvania Department of Environmental Resources, Harrisburg, Bureau of Topographic and Geologic Survey, 1971. 103 p.

Descriptors: *Sedimentation, *Sandstones, *Water pollution sources, *Coal mine wastes, *Pennsylvania, Sedimentary structures, Lithification, Geology, Coal mines, Runoff, Seepage, Ecology, Environmental effects, Mine acids.
Identifiers: *Susquehanna County (Penn), *Wyoming-Lackawanna Valley (Penn).

This Guidebook for the 36th Annual Field Conference of Pennsylvania Geologists held October 8-9, 1971 includes two reports: 'Upper Devonian sedimentation in Susquehanna County,' by Stephen A. Krajewski, and Eugene G. Williams, Pennsylvania State University; and 'Hydrology, glacial geology and environmental geology of the Wyoming-Lackawanna County,' by Jerrald R. Hollowell, U. S. Geological Survey. The first report describes the origin, occurrence, and properties of Pennsylvania flagstone in Susquehanna County, Pennsylvania. The second report presents environmental problems resulting from the removal of coal from the Wyoming-Lackawanna Valley in Pennsylvania. (See W72-06927 and W72-06928) (Woodard-USGS)
W72-06926

UPPER DEVONIAN SEDIMENTATION IN SUSQUEHANNA COUNTY AND ITS APPLICATIONS IN THE PREDICTION AND MINING OF FLAGSTONE,
Pennsylvania State Univ., University Park.
S. A. Krajewski, and E. G. Williams.
In: Proceedings of 36th Annual Field Conference of Pennsylvania Geologists, October 8-9, 1971, Wilkes Barre, p 1-76, 1971. 35 fig, 12 tab.

Descriptors: *Sedimentology, *Sediment transport, *Geology, *Sandstones, *Pennsylvania, Deposition (Sediments), Lithification, Sedimentary structures, Alluvium, Sedimentation, Quarries, Mining.
Identifiers: *Flagstone, *Susquehanna County (Penn).

The origin, occurrence, and properties of Pennsylvania flagstone in Susquehanna County, Pennsylvania, are presented. Considerable variability in the composition, texture, and color of the flagstone was observed in many of the producing quarries. All were found to be dense, compact sandstones in deposits between one and twenty feet thick which split (part) along well defined planes of weaker cohesion that were parallel to the original bedding; therefore, the flagstones can be mined in large slabs or sheets which have a very smooth upper and lower parting surface. Planar bedding and parting lineations were produced by water currents under high regime flow. The water flowed over the sediments very rapidly in essentially a straight line so that it experienced very little, if any, turbulence. These flow conditions can only be produced under certain hydraulic conditions within specific environments. If these flow conditions are operated to a lesser degree, or if they are exceeded, the sediments will not be deposited in planar beds but in cross-beds that form as various types of ripples. (See also W72-06926) (Woodard-USGS)
W72-06927

HYDROLOGY, GLACIAL GEOLOGY AND ENVIRONMENTAL GEOLOGY OF THE WYOMING-LACKAWANNA VALLEY,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 05B.
W72-06928

VELOCITY-GRADIENT PATHS IN COAGULATION,
Montgomery (James M.) Consulting Engineers, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 05F.
W72-06973

BOTTOM SEDIMENTS OF LAKE CHAMPLAIN: 1965-1971,
Vermont Univ., Burlington. Dept. of Geology.
Allen S. Hunt.
Completion report, December 1971. 127 p, 2 fig, 1 tab, 14 ref, 7 append, 4 map folios. OWRR Project A-003-VT (3).

Descriptors: *Bottom sediments, Lake beds, *Particle size, Sediment distribution, Sediments, Deposition (Sediments), *Lake soils, Distribution patterns, Manganese, Sands, Silts, Clays, Gravels, Vermont, Lakes.
Identifiers: *Lake Champlain (Vt).

A reconnaissance study of the composition and distribution of sediments in Lake Champlain has provided information which should be useful in maintaining the quality of the lake's waters. Five basic sediment types have been recognized: gravels, sands, muds, iron manganese deposits, and lake clays. The distribution of sands, gravels, and muds can be explained by wave action. Grain size data indicate that, except in the smaller bays, mean grain size and sorting are controlled primarily by water depth. Sediment source also has a major effect on the grain size properties of near shore sediments. The nodules are of chemical origin and the clays ancient marine and/or premarine lake clays that have been exposed through erosion by deep water currents. The composition of recent sediments resting above these ancient deposits suggests conditions of increasing natural eutrophication succeeded by cultural pollution.
W72-06975

TURBIDITY MEASUREMENT,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
R. M. Duchrow, and W. H. Everhart.
Transactions of the American Fisheries Society, Vol 100, No 4, p 682-690, October 1971. 4 fig, 5 tab, 11 ref.

Descriptors: *Sediment transport, *Suspension, *Turbidity, *Aquatic environment, *Colorado, Colloids, Physical properties, Analytical techniques, Sampling, Measurement, Evaluation, Reservoirs, Fish physiology, Sediments, Streams, Watersheds (Basins).
Identifiers: *Blue Mesa Reservoir (Colo.).

Water samples from four study streams in Colorado were collected between May and September, 1969 for analyses of the contribution of settleable solids to the total turbidity of water. Samples were collected at three-week intervals on Soap Creek and three of its tributaries. Turbidity of water is a questionable parameter for establishing water quality standards because too many factors must remain constant before a Jackson Turbidity Unit can be converted to a corresponding suspended sediment concentration. The main concern with regard to the protection of aquatic fauna from lethal sediment concentrations is the amount of solids in suspension that can potentially settle out as flow decreases, that is settleable solids. The type of solid in suspension varies the effect on aquatic fauna. Specific water-quality standards for settleable solids must be established for each specific situation. Sediment type and aquatic fauna will probably be different at each site. Standard techniques for measuring settleable solids using Imhoff settling cones should be used to check and enforce these standards, once they have been set. (Woodard-USGS)
W72-07000

ENGINEERING PROPERTIES OF SUBMARINE CALCAREOUS SOILS FROM THE PACIFIC,
San Diego State Coll., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02L.
W72-07001

COMPUTATION OF FLUVIAL-SEDIMENT DISCHARGE,
Geological Survey, Washington, D.C.
G. Porterfield.
Available from GPO, Washington, D.C. 20402 Price-$0.75 Stock No. 2401-2061. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chapter C3, 1972. 66 p, 45 fig, 4 tab, 61 ref.

Descriptors: *Sediment transport, *Rivers, *Sediment discharge, *Sediment yield, Mathematical studies, Analytical techniques, Particle size, Hydrologic data, Sediment load, Streamflow, Flow rates, Data collections, Data processing.
Identifiers: *Fluvial-sediment discharge, Computation methods.

This report is one of a series concerning the concepts, measurement, laboratory procedures, and computation of fluvial-sediment discharge. Procedures and forms used to compile and evaluate particle-size and concentration data, to compute fluvial-sediment discharge, and to prepare sediment records for publication are described. (Woodard-USGS)
W72-07002

SEISMIC REFRACTION SURVEY OF PLEISTOCENE DRAINAGE CHANNELS IN THE LOWER GREAT MIAMI RIVER VALLEY, OHIO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W72-07007

FRICTION FACTORS IN SOLID MATERIAL LADEN SYSTEMS,
Middle East Technical Univ. Ankara (Turkey) Dept. of Civil Engineering.
E. R. Acaroglu.
Journal of the Hydraulic Division American Society of Civil Engineers vol 98, HY4, Paper 8854, p 681-699, April 1972. 5 fig, 3 tab, 21 ref, append.

Descriptors: *Darcy-Weisbach equation, *Sediment transport, *Bed load, *Suspended load, *Hydraulic models, Channel morphology, Dimensional analysis, Hydraulics, Alluvial channels, Pipe flow, Turbulence, Discharge coefficient.

The value of the Darcy-Weisbach friction factor is necessary for calculating energy losses in transporting solid materials. The Darcy-Weisbach friction factor is divided into two parts. One is related to the grain roughness and the other is related to the form drag of the bed configuration or modes of transport. The form-drag factor is expressed as a function of particle size and shape. Dimensional analysis is used to describe the variables involved in the resistance phenomenon both in free surface and pressurized flows. The wide scatter of the data points reflects the need for better experimental techniques and a better understanding of transport modes and bed forms. (Knapp-USGS)
W72-07010

RIVER BED DEGRADATION AFTER CLOSURE OF DAMS,
Alexandria Univ. (Egypt). Faculty of Engineering.
H. Y. Hammad.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 98, No. HY4, Paper 8814, p 591-607, April 1972, 5 fig, 5 tab, 25 ref, append.

Descriptors: *Scour, *Dams, *Stream erosion, *Degradation (Stream), Sedimentation, Outlets, Reservoirs, Spillways, Tailwater, Weirs.
Identifiers: Aswan Dam (Egypt).

The release of clear water from dams built across rivers running in alluvial sediments will cause bed degradation in the downstream channel. If this degradation went unchecked, it would be a threat to the existing structures on the river, and might cause serious drainage problems in the cultivated areas on both sides of the river. A theory is presented to predict the ultimate conditions of bed armoring without sensible change in slope. The changes in bed roughness and in the regime of flow are both taken into consideration. The ultimate conditions of stable bed are obtained. The theory is then applied to the actual conditions of bed degradation of the Nile River after the closure of the Aswan High Dam in 1964. The general degradation in this particular case is not excessive, and does not need large scale protective measures or step-down weirs, to meet the probable change in the slope of river bed. However, the existing barrages on the Nile may need protection against any probable local or general scour. (Knapp-USGS)
W72-07020

APPRAISAL OF STREAM SEDIMENTATION IN THE SUSQUEHANNA RIVER BASIN,
Geological Survey, Washington, D.C.
K. F. Williams, and L. A. Reed.
Available from GPO, Washington, DC 20402-Price 25 cents (paper cover) Stock No 2401-1228. Geological Survey Water-Supply Paper 1532-F, 1972. 24 p, 8 fig, 5 tab, 30 ref.

Descriptors: *Sediment transport, *River basins, *Pennsylvania, *Sediment yield, *Hydrologic data, Land use, Environmental effects, Bed loads, Particle size, Suspended load, Hydrographs, New York, Chesapeake Bay.
Identifiers: *Susquehanna River basin.

The Susquehanna River transports about 3.0 million tons of sediment annually (110 tons per square mile). Only about 1.8 million tons of sediment enters the head of Chesapeake Bay annually because some sediment is trapped behind the power dams on the lower Susquehanna. Measured annual sediment yields from subbasins in Susquehanna range from 40 to 440 tons per square mile. The highest yields are from parts of the glaciated section of the basin, in the anthracite coal region, and the Piedmont province. The lowest yields are from parts of the glaciated section of the basin and the Appalachian high plateau. There has been a downward trend of sediment discharge in recent years. In the future, the high sediment yields associated with urbanization may offset this downward trend. (Woodard-USGS)
W72-07024

CAUSES OF SPHEROIDAL WEATHERING,
Canberra Coll. of Advanced Education, (Australia).
C. D. Ollier.
Earth-Science Reviews, Vol. 7, No. 3, p 127-141, August 1971. 6 fig, 32 ref.

Descriptors: *Weathering, *Geomorphology, *Microenvironment, *Cracking, *Erosion, Arid lands, Temperature, Abrasion, Structural geology, Geologic formations, Water circulation.

Compared to igneous and sedimentary structures, weathering structures have received very little attention. Our present knowledge is relatively primitive, comparable to our knowledge of sedimentary structures 30 years ago. If weathered boulders are found to consist of a crestone surrounded by a number of roughly concentric sheets or layers, they have undergone spheroidal weathering. This type of weathering is due to a process or processes acting all around a boulder, affecting the bottom as well as the top. Spheroidal weathering is commonest in uniform, hard rocks which are well jointed, especially granite dolerite and basalt. The concentric shells are usually a mm or cm thick and more or less uniform in thickness in any locality. A number of hypotheses are advanced to explain this phenomenon including various forms of expansion, unloading, constant volume alteration, Liesegang phenomena, micro-cracks and various minor mechanisms. (Casey-Arizona)
W72-07039

BENTHIC FAUNA AND SEDIMENTS IN THE NEWLY CREATED LAKE KARIBA (CENTRAL AFRICA),
Nuffield Lake Kariba Research Station (Rhodesia), and Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 02H.
W72-07065

OPAQUE MINERALS FROM THE SHELF SEDIMENTS OFF MANGALORE, WESTERN COAST, INDIA,
Geological Survey of India, Calcutta.
T. K. Mallik.
Marine Geology, Vol 12, No 3, p 207-222, March 1972. 3 fig, 1 plate, 2 tab, 19 ref.

Descriptors: *Mineralogy, *Bottom sediments, *Iron compounds, *Provenance, *Distribution patterns, Sands, Currents (Water), Sedimentation, Sediment transport, Sampling, Sedimentology.
Identifiers: *India, *Mangalore (India).

Magnetite, ilmenite, hematite, cryptocrystalline hydroxides of iron (including goethite-lepidocrocite), rutile, and pyrite occur in the Mangalore shelf, (India) sediments. The distribution patterns of magnetite, ilmenite, hematite, and goethite-lepidocrocite are basically similar, and the minerals are derived from the catchment areas of the Netravati and Gurpur rivers and concentrated in the near-coastal environments at the mouths of these two rivers due to their high densities. Authigenic pyrite characterized by framboidal texture shows an entirely different distribution pattern, as the mineral is absent or present in very minor amounts in the near-coastal sandy and sandy clay zone. Formation of pyrite seems to be favored in the region 6-7 km away from the coast beyond 20 m in the dark grey clay zone. On the basis of the distribution patterns of the opaque minerals, the offshore region of the Mangalore coast can be divided into 4 zones: (1) the Netravati-Gurpur near-coastal zone with abundant magnetite, ilmenite and hematite; (2) the offshore zone beyond 20 m characterized by authigenic pyrite; (3) the intermediate zone representing a combination of the two and (4) the northern zone characterized by magnetite-hematite representing a different source. The study of opaque minerals alone from the offshore areas can be used as a reliable guide to the provenance of sediments and the environment of deposition. (Knapp-USGS)
W72-07228

SUSPENDED MATTER IN THE CARIBBEAN SEA: A GRAVIMETRIC ANALYSIS,
Texas A and M Univ., College Station. Dept. of Oceanography.
N. J. Bassin, J. E. Harris, and A. H. Bouma.
Marine Geology, Vol. 12, No. 3, p M1-M5, March 1972, 2 fig, 16 ref. ONR Grant N 00014-68A-0308-0002 NSF Grant GA-1296.

Descriptors: *Suspended load, *Sea water, *Sampling, Gravimetric analysis, Water analysis, Turbidity, Suspension.
Identifiers: *Caribbean Sea.

Total suspended matter in the water column of the Caribbean was determined quantitatively by means of filtration through membrane filters. Prior values obtained by centrifuging methods are too low, and the existence of a nepheloid layer cannot be gravimetrically demonstrated in the Caribbean. (Knapp-USGS)
W72-07229

ON THE EQUILIBRIUM OF COEXISTING SEDIMENTARY CARBONATES,
Hahn-Neitner-Institut fuer Kernforschung, Berlin (West Germany). Nuclear Chemistry Div.
P. Bratter, P. Moller, and U. Rosick.
Earth and Planetary Science Letters, Vol 14, No 1, p 50-54, February 1972. 3 fig, 1 tab, 15 ref.

Descriptors: *Carbonate rocks, *Diagenesis, *Leaching, *Equilibrium, Carbonates, Calcite, Dolomite, Sediments, Sedimentology, Water chemistry, Mineralogy, Aqueous solutions, Lithification.

The chemical composition of surface layers on calcite and an overgrowth on dolomite (which proved to be calcite) were determined in solutions of varying amounts of Mg. An apparent equilibrium exists between surface layers of the carbonates and solutions. Self diffusion of Ca and Na diffusion coefficients in calcite were determined in order to study the ion mobility in the lattice. These values suggest that cation replacement does not change the chemical composition of calcite to an appreciable extent. Thus, if recrystallization is absent, equilibrium between solid and solution is approached only at the surface layers or in the overgrowth. The bulk of solid might remain unchanged even on a geological time scale. (Knapp-USGS)
W72-07232

2K. Chemical Processes

DETECTION AND IDENTIFICATION OF MOLECULAR WATER POLLUTANTS BY LASER RAMAN SPECTROSCOPY,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 05A.
W72-06611

REDUCTION OF SULFATE TO SULFIDE IN WATERLOGGED SOIL,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W72-06678

MINERAL EQUILIBRIA IN ECOSYSTEM GEOCHEMISTRY,
Dartmouth Coll., Hanover, N.H. Dept. of Earth Sciences.
Noye M. Johnson.
Ecology. 52 (3): 529-531. 1971.
Identifiers: Ecosystem, Equilibria, Geochemistry, Mineral, Runoff.

In terrestrial ecosystems the composition of runoff water may not reflect chemical equilibrium conditions, but rather chemical flux conditions through an open system. The irreversible flow of chemicals through the boundaries of an ecosystem, as exemplified by chemical weathering, may assume a time-invariant mode (steady-state) which resembles a state of equilibrium in a closed system.--Copyright 1971, Biological Abstracts, Inc.
W72-06749

INTERFEROMETRIC STUDY OF FREEZING OF SEA WATER,
Northwestern Univ., Evanston, Ill. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 02C.
W72-06760

MAPS OF THE WATERSHEDS OF THE SANTA MARGARITA AND SAN LUIS REY RIVERS, RIVERSIDE AND SAN DIEGO COUNTIES, CALIFORNIA SHOWING GROUND-WATER QUALITY DATA, 1971,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-06770

HEAVY METALS ANALYSES OF BOTTOM SEDIMENT IN THE POTOMAC RIVER ESTUARY,
Environmental Protection Agency, Annapolis, Md. Field Office.
For primary bibliographic entry see Field 05B.
W72-06772

COMPUTER PROGRAMS IN USE IN THE WATER QUALITY DIVISION, VOL. 3,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 07C.
W72-06780

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, DEEP SEA DRILLING PROJECT, LEG 7,
Woods Hole Oceanographic Institution, Mass.
F. L. Sayles, and F. T. Manheim.
In: Initial Reports of the Deep Sea Drilling Project, Vol 7, Part 2, National Science Foundation, p 871-881, 1971: U.S. Government Printing Office, Washington, D.C. 1 fig, 2 tab, 5 ref.

Descriptors: *Water analysis, *Core drilling, *Cores, *Pacific Ocean, *Sediments, Chemical analysis, Data collections, Oceanography, Ions.
Identifiers: *Interstitial water, Deep-sea drilling.

Major and minor dissolved constituents of the interstitial waters sampled in the Pacific Ocean by the Woods Hole Oceanographic Institution during Leg 7 are presented. The compositional changes in most constituents are relatively small but significant. Potassium characteristically is enriched in shallow samples (to 0.45 gm/kg) and is depleted to seawater concentrations or less at greater depths. Magnesium is commonly depleted to concentrations of 1.00 to 1.10 gm/kg. Sulphate is depleted to a variable degree at 3 sites (2.00 to 2.50 gm/kg) and to a lesser extent at other sites. The sediments cored are predominantly deep sea biogenic oozes and chalks; only rarely were significant quantities of pelagic clays and volcanic detritus encountered. The biogenic sections include both siliceous and calcareous deposits. (See also W72-06783) (Woodard-USGS)
W72-06782

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, DEEP SEA DRILLING PROJECT, LEG 8,
Geological Survey, Woods Hole, Mass.; and Woods Hole Oceanographic Institution, Mass.
F. T. Manheim, and F. L. Sayles.
In: Initial Reports of the Deep Sea Drilling Project, Vol 8, National Science Foundation, p 857-869, 1971: U.S. Government Printing Office, Washington, D.C. 3 fig, 4 tab, 19 ref.

Descriptors: *Water analysis, *Core drilling, *Cores, *Pacific Ocean, *Sediments, Chemical analysis, Data collections, Ions, Oceanography.
Identifiers: *Interstitial water, Deep-sea drilling.

Leg 8 sites for the Pacific Ocean interstitial water studies (Woods Hole Oceanographic Institute) are dominated by siliceous-calcareous biogenic oozes having depositional rates of 0.1 to 1.5 cm/1000 years. Conservative constituents of pore fluids showed insignificant or marginally significant changes with depth and location. However, in 2 sites, calcium, magnesium and strontium showed major shifts in concentration with depth. These changes appear to be related to recrystallization phenomena in skeletal debris of nannoplankton and to the relative accumulation rate of the sediments. The chemical anomalies increase relatively smoothly with depth, demonstrating the effectiveness of vertical diffusional communication and apparent lack of bulk fluid movement. The chemical analyses of major constituents in the pore fluids are listed with bulk water and pH data, as supplied from the preliminary shipboard logs. Minor constituents are also tabulated. The major cations generally demonstrated satisfactory precision. However, occasionally, large discrepancies were apparent in the case of the alkalinities and bicarbonate values calculated from them. (See also W72-06782) (Woodard-USGS)
W72-06783

DISCRIMINATION OF STRONTIUM-90 IN RELATION TO CALCIUM IN FRESH-WATER PLANTS,
L. I. Piskunov, and S. I. Treiger.
Radiobiologiya. 10 (5): 788-790. 1970. Illus.
Identifiers: Calcium, Ceratophyllum-demersum-D, Cladophora-fracta, Discrimination, Elodea-canadensis-M, Myriophyllum-spicatum-D, Plants, Relation, Rhizoclonium-hieroglyphicum, Strontium-90.

Results are given of the statistical treatment of published laboratory experiments on the accumulation and discrimination of Sr90 in fresh water plants Rhizoclonium hieroglyphicum, Cladophora fracta, Myriophyllum spicatum, Elodea canadensis, and Ceratophyllum demersum in relation to the Ca concentration in the water. A regression equation is discussed. The coefficients of discrimination depend on the Ca concentration.--Copyright 1971, Biological Abstracts, Inc.
W72-06788

HYDROGEOLOGIC DATA FOR THE UPPER CONNECTICUT RIVER BASIN, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 04B.
W72-06792

METHODS OF ANALYSIS OF NATURAL WATERS, (METODY ANALIZA PRIRODNYKH VOD),
A. A. Reznikov, Ye. P. Mulikovskaya, and I. Yu. Sokolov.
Izdatel'stvo 'Nedra', Moscow, 1970. 488 p.

Descriptors: *Water chemistry, *Chemical analysis, *Water analysis, *Analytical techniques, *Testing procedures, Water properties, Water quality, Water types, Physical properties, Chemical properties, Trace elements, Metals, Inorganic compounds, Organic compounds, Organic matter, Gases, Ions, Sampling, Instrumentation, On-site laboratories.
Identifiers: *USSR, *Natural waters, *Water samples, Reagents, Nephelometry, Balneology.

The purpose of this third and substantially revised edition of a manual on water analysis is to record current methods of analysis of the chemical composition of natural waters, considering primarily water-quality investigations and problems related to sample collection. The analytical techniques examined include gravimetric, volumetric, colorimetric, nephelometric, flame-photometric, fluorometric, and amalgam-polarographic procedures, as well as the methods for pH and Eh. Considerable emphasis is placed on the methods used to determine trace elements vital to the activities of animal and plant organisms and indicative of the occurrence of mineral deposits. These elements include Al, Be, B, Br, V, W, Ga, Ge, Au, In, Cd, Ca, K, Co, Li, Mg, Mn, Cu, Mo, As, Ni, Nb, Hg, Rb, Pb, Ce, Ag, Sr, Te, U, P, F, Cs, and Zn. Analytical methods are given for determining organic substances (naphthenic acids, phenols, total oxidation) and dissolved gases (CO_2, O_2, H_2S). The manual may also be used in connection with determining the suitability of natural waters for domestic, industrial, and agricultural uses, balneology, and for underground and highway construction. (Josefson-USGS)
W72-06801

THERMAL WATERS OF FOLD AND PLATFORM REGIONS OF THE USSR (TERMAL'NYYE VODY SKLADCHATYKH I PLATFORMENNYKH OBLASTEY SSSR),
All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).
B. F. Mavritskiy.
Izdatel'stvo 'Nauka', Moscow, 1971. 244 p.

Descriptors: Water chemistry, *Geochemistry, *Geothermal studies, *Thermal water, *Borehole geophysics, Hydrogeology, Structural geology, Geologic formations, Folds (Geologic), Water types, Groundwater, Mineral water, Thermal springs, Brines, Salts, Gases, Volcanoes, Aquifers, Artesian aquifers, Maps.
Identifiers:: *USSR, *Fold systems, *Platforms (Geologic), *Grabens, Volcanic belts, Geothermal gradient, Artesian basins, Mineralization, Regionalization.

This monograph examines the formation and distribution of thermal waters of the USSR and their confinement to such specific structural features as platforms, grabens, depressions, and fold systems. Particular attention is given to the influence of the compositional features of rocks on the temperature, chemical composition, and mineralization of the waters. Potential use of the thermal waters for the USSR as a whole and for individual regions is evaluated in terms of its effect on the national economy. (Josefson-USGS)
W72-06804

FORMATION OF THE CHEMICAL COMPOSITION OF GROUNDWATERS OF THAWED AREAS WITHIN PERMAFROST IN CENTRAL YAKUTSK ASSR (FORMIROVANIYE KHIMICHESKOGO SOSTAVA PODZEMNYKH VOD TALIKOV NA PRIMERE TSENTRAL'NOY YAKUTII),
Akademiya Nauk SSSR, Moscow. Institut Merzlotovedeniya.
For primary bibliographic entry see Field 02C.
W72-06806

LIMNOLOGICAL STUDIES IN BELGIUM: IV. THE VIEIL-ESCAUT POND IN BORNEM,
Institut Royal des Sciences Naturelles de Belgique, Brussels.
Ludo Van Meel.

Bull Inst Roy Sci Natur Belg. 45 (40): 1-92. 1969. Illus.
Identifiers: Belgium, Bornem, Limnological, Minerals, Nutrients, Phytoplankton, Pond, Vieil-Escaut.

The water of the Vieil-Escaut Pond at Bornem was studied monthly for a 1-yr period in 2 places, for its ecology and phytoplankton. Geochemically, the water is characterized as hexaionic, having 3 ions and 3 cations. The following elements were determined regularly: pH, alkalinity, chlorides, sulfates, nitrates, phosphates and silicates, Ca, Mg, Na and K, saturation of dissolved O2, oxidizability (organic matter) and carbohydrates. Biologically, the chlorophyll in the phytoplankton was studied and determined. More or less well-defined and periodic correlations were noted between variations in the various chemical components of the water and the chlorophyll level, especially relationships between carbonic acid-calcium and chlorophyll, over-saturation in O2 and chlorophyll production, nitrates and phytoplankton, and phosphate use by the zooplankton. The chlorophyll level follows the seasons with their periods of vegetation and decline. Comparative analyses show a great increase in several elements: alkalinity, Ca, nitrates. The disappearence of several phytoplankton species is attributed to the eutrophication of the water. All of the species collected to now are enumerated in a systematic list.--Copyright 1971, Biological Abstracts, Inc.
W72-06827

LIMNOLOGICAL STUDIES IN BELGIUM: III. A POND AT UITBERGEN,
Institut Royal des Sciences Naturelles de Belgique, Brussels.
L. Van Meel.
Bull Inst Roy Sci Natur Belg. 45 (27): 1-12. 1969.
Identifiers: Asterionella formosa, Belgium, Ceratium hirundinella, Chlorophyta, Closterium macilentum, Limnological, Mallomonas acaroides, Pond, Synura uvella, Uitbergen.

This pond in the Overmere region (Eastern Flanders) was studied monthly for 1 yr. The concentration of various components of the water was determined: alkalinity, chlorides, sulfates, nitrates, nitrites, phosphates, silica, carbohydrates, organic matter, O2, Ca, mg, Na and K with the chlorophyll level. The periods of O2 deficiency and oversaturation correspond to the maximum chlorophyll concentration. The same is true for the nitrate concentration, which is also inversely proportional to the chlorophyll concentration. The phytoplanktonic population was composed of 1 Chlorophyta-Protococcales association with irregular dominance of species of other groups, such as Asterionella formosa, Ceratium hirundinella, Mallomonas acaroides, Synura uvella, and Closterium macilentum.--Copyright 1971, Biological Abstracts, Inc.
W72-06828

LIMNOLOGICAL STUDIES IN BELGIUM: II. THE LARGE POND OF THE OVERMERE SWAMP,
Institut Royal des Sciences Naturelles de Belgique, Brussels.
For primary bibliographic entry see Field 02K.
W72-06829

LIMNOLOGICAL STUDIES IN BELGIUM: II. THE LARGE POND OF THE OVERMERE SWAMP,
Institut Royal des Sciences Naturelles de Belgique, Brussels.
L. Van Meel.
Bull Inst Roy Sci Natur Belg. 45 (26): 1-68. 1969. Illus.
Identifiers: Belgium, Chlorophyll, Limnological, Minerals, Nutrients, Overmere, Phyto, Plankton, Pond, Swamp.

The ecological and phytoplanktonic characteristics of the water in the Overmere Pond were determined by the monthly study, for 15 mo., of the water in 3 places. Geochemically, the pond is characterized as having hexaionic water, with 3 ions and 3 cations. Chemically, the following elements were regularly determined: pH, alkalinity, chlorides, sulfates, nitrates, phosphates and silicates, Ca, Mg, Na and K, the O2 saturation, the oxidizability of organic matter and carbohydrates. Biologically, the chlorophyll in the phytoplankton was determined. Clear differences were observed between the northern and southern parts of the lake, as well as notable differences from the swampy part. Well-defined and periodic correlations were found between variations in various chemical constituents of the water and the chlorophyll. This is especially the case for carbonic acid-calcium-chlorophyll ratios, oversaturation of dissolved O2 and chlorophyll production, nitrates and phytoplankton. The chlorphyll level varies with the seasons. Compared to data dating from 1904, there is more dissolved organic matter and more sulfates, causing eutrophication of the pond and the subsequent disappearance of many planktonic species. A systematic list of all of the species collected to the present is provided.--Copyright 1971, Biological Abstracts, Inc.
W72-06829

ABSORPTION OF FERRIC IRON IN REDUCED SODA-SILICA GLASSES CONTAINING CHALCOGENIDES,
Acta Polytechnica Scandinavica, Stockholm (Sweden).
Kaj H. Karrlson.
Available from the National Technical Information Service as PB-202 663, $3.00 in paper copy, $0.95 in microfiche. Reprint No. 101, 38 p, 17 fig, 13 tab, 51 ref.

Descriptors: *Molecular structure, *Oxidation-reduction potential, *Chemical analysis, Analytical techniques, Laboratory tests, Sulphides, Iron, Oxygen, Oxidation, Ions, *Absorption, Spectrophotometry.
Identifiers: *Electron transfer, *Soda-silica glasses, *Chalcogenides, Ligands, Selenide, Selenium.

In an iron doped soda-silica glass melted under reducing conditions oxygen was partly replaced by other chalcogenides and the absorption spectra between 8 and 50 kK were recorded. It has been verified that sulphur and selenium dissolve by replacing non-bridging oxygen ions. The mechanism for tellurium is not known, but it is suggested that it is at least partly oxidized and occupies cation vacancies. The coordination of the ferric ion surrounded by oxygen is found to be mainly tetrahedral and no evidence is found that this is not the case even in an environment of sulphide and selenide. The ligand field splitting, or subshell energy difference, of the Fe0-4 complex is -6.35 kK, the Racah parameter B assuming a value of 705 K. The electron transfer absorptions move to lower wavenumbers as the ligand becomes more easily oxidized. Tellurium even undergoes spontaneous oxidation, thus reducing all the ferric iron. Further the different electron transfer absorptions have been identified as due to the transitions pi t1 yields 3de, pi t2 yields 2dt2 and e yields 3de when going towards higher wavenumbers. The optical electronegativities of the ligands were found to be 02-2.9 and Se2-2.8. (Lowry-Texas)
W72-06862

RED SEA HOT BRINE AREA: REVISITED,
Woods Hole Oceanographic Institution, Mass.
D. A. Ross.
Science, Vol 175, No 4029, p 1455-1457, March 31, 1972. 1 fig, 15 ref.

Descriptors: *Brines, *Hot springs, *Bottom sediments, *Density stratifications, *Minerology, Geothermal studies, Geochemistry, Oceanography, Water chemistry, Aqueous solutions, Metals, Chemical precipitation, Heat flow, Saline water, Exploration, Geologic control.
Identifiers: Red Sea, Hot brines.

Data collected on expeditions made in 1966 and 1971 to the hot brine area of the Red Sea are summarized. A comparison of findings shows that the temperature of the brines has increased, indicating that the process that formed the underlying deposits rich in heavy metals is still occurring. The sediments beneath the hot brine are unusually enriched in copper, zinc, lead, and silver. Probable source of the brine and the hydrogeologic and tectonic framework of the region are discussed. About 0.346 cubin kilometers of water having a minimum temperature of 104 deg C has been discharged from underground sources during the 52 months between the expeditions. Calculations suggest a relatively shallow depth as the source for the brine. Fracture areas found north and south of the brine area indicate a local source, rather than the Strait of Bab el Mandeb (1000 km to the South), as previously suggested. (See also W70-07394) (Land-USGS)
W72-06910

ZERO PADDING AS A MEANS OF IMPROVING DEFINITION OF COMPUTED SPECTRA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 07B.
W72-06924

THE KINETICS OF HETEROGENEOUS ISOTOPIC EXCHANGE,
Fisons Ltd., Ipswich (England). Levington Research Station.
For primary bibliographic entry see Field 02G.
W72-07021

AGEING OF HYDROLYSED IRON (III) SOLUTIONS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Soils and Crops.
For primary bibliographic entry see Field 02G.
W72-07022

ELECTROCHEMICAL POTENTIALS OF HIGH PURITY METALS IN SEA WATER,
Naval Research Lab., Key West, Fla. Marine Corrosion Research.
R. E. Groover, J. A. Smith, and T. J. Lennox, Jr.
Corrosion, Vol 28, No 3, p 101-104, March 1972. 5 fig, 1 tab.

Descriptors: *Electrochemistry, *Metals, *Sea water, *Electrodes, Analytical techniques, Chemical potential, Chemical reactions, Water chemistry, Water temperatures, Histograms, Instrumentation.
Identifiers: *Electrochemical potentials, High purity metals, Research project, Silver, Bismuth, Tin, Galvanic anode.

The electrochemical potentials of high purity metals were determined in quiescent sea water. The data are presented as histograms and as potential-time graphs. The electrochemical potential of many of the metals never reached a steady value, so it is impractical to assign a specific potential value to these metals. A galvanic series is included based on a subjective ranking of the histograms. Two of the metals, bismuth and tin, had relatively stable potentials in sea water, but they do not appear to offer any advantage over the Ag/AgCl reference electrode. The comparatively negative potential of the high purity aluminum may be of interest because of the possibility that a high potential galvanic anode with the weight advantage of aluminum could be developed. (Woodard-USGS)
W72-07028

WATER RESOURCES DATA FOR TEXAS: PART 2. WATER QUALITY RECORDS, 1969.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 05A.
W72-07029

SALT CRYSTALLIZATION AND ROCK WEATHERING: A REVIEW,
Royal Coll. of Art, London (England).
I. S. Evans.
Revue de Geomorphologie Dynamique, Vol. 19, No. 4, p 153-177, October-November-December, 1969-1970. 142 ref.

Descriptors: *Salts, *Crystallization, *Water of crystallization, *Weathering, *Supersaturation, Geomorphology, Crystal growth, Solubility, Arid lands, Structural geology, Land forming, Granules, Supercooling, Sodium, Leaching, Chemical properties, Surface tension, Hydrostatic pressure, Solubility.
Identifiers: *Salt crystallization, *Rock weathering.

Salt crystallization is a deleterious influence on building stones in many areas yet the process is not generally accorded an important role in rock weathering. Many geomorphology tests ignore the process altogether. An attempt is made to assess the role of salt crystallization in various geological processes and to synthesize information from geology, building technology and physical chemistry. Data from a variety of diverse sources clearly demonstrate that crystallization can progress even against a large confining force. A growing crystal generates enough tension to widen a crack and to propagate it by tensile fracture. A film of supersaturated solution only a few molecules thick, lacking normal fluid properties, transmits the stress. The extent of crystallization is a function of supersaturation and the salt solubility stress coefficient. Frost heaving and crystallization are 2 similar but distinct phenomena. Rounding by granular disaggregation is the most common form of salt crystallization but angular fragmentation has also been observed. In many arid regions crystallization is the only weathering process correlated with the distribution of cavernous and alveolar forms. They are absent where leaching is strong and where little salt is available. Crystallization and weathering in such areas mainly occur in sheltered, locally moist places. (Casey-Arizona)
W72-07034

THE EFFECT OF SALINITY ON THE MAXIMUM THERMAL GRADIENT OF A HYDROTHERMAL SYSTEM AT HYDROSTATIC PRESSURE,
Geological Survey, Washington, D.C.
J. L. Haas, Jr.
Economic Geology, Vol. 66, No. 6, p. 940-946, September-October 1971. 2 fig, 2 tab, 20 ref.

Descriptors: *Temperature, *Salinity, *Hydrostatic pressure, *Brines, *Physicochemical properties, Geothermal studies, Sodium, Calcium, Chlorides, Potassium, Boiling, Crystal growth.

The temperature-depth relations were calculated for an open vein system where the liquid is everywhere virtually at the boiling point for the confining hydrostatic pressure. The pressure at the top of the open system was taken as 1 atm. The effect of salinity on the temperature-depth relations was calculated by a mathematical model. Such data might be useful in many applications including the study of brine behavior in geothermal areas which may contain compositional stratification. The available data for NaCl-water solution were used as approximations for the Na-Ca-K-Cl brine which is found naturally in thermal springs and in fluid inclusions in ore minerals. The precision of the calculations based on the NaCl-water model is 0.7% which is better than the certainty that the model will be equivalent to the more complex brines. The depth to an isotherm in a 5, 10, 15, 20 and 25 wt % NaCl system, respectively, is 92, 84, 77, 70 and 63% of the depth to the same isotherm in a 'pure' water-filled vein system. From the data presented, it is possible to estimate the maximum depth below the water at which a crystal grew if the inclusions in the crystal indicated there was boiling at the time of growth. (Casey-Arizona)
W72-07064

PREPARATION OF LARGE BORE OPEN TUBULAR COLUMNS FOR GC,
Western Regional Research Lab., Albany, Calif.
For primary bibliographic entry see Field 05A.
W72-07151

KINETIC METHOD FOR DETERMINING BROMIDE IONS IN WATER USING CHROMOTROPE 2B,
Donetsk Polytechnic Inst. (USSR).
For primary bibliographic entry see Field 05A.
W72-07155

DETERMINATION OF COPPER, PALLADIUM, ANTIMONY, AND BISMUTH,
Punjabi Univ., Patiala (India).
For primary bibliographic entry see Field 05A.
W72-07158

DETECTION AND QUANTITATIVE DETERMINATION OF SUBMICROAMOUNTS OF RUTHENIUM IN THE ZONES ON PAPER CHROMATOGRAMS AND ELECTROPHOREGRAMS BY A KINETIC METHOD,
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analiticheskoi Khimii.
For primary bibliographic entry see Field 05A.
W72-07159

A FLEXIBLE COMPUTER PROGRAM FOR CALCULATIONS IN EMISSION-SPECTROGRAPHIC ANALYSIS,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 05A.
W72-07161

SPECTROCHEMICAL PERFORMANCE OF A COMPUTER-CONTROLLED DIRECT READING SPECTROMETER,
Rank Precision Industries Ltd., London (England). Analytical Div.
For primary bibliographic entry see Field 07B.
W72-07173

THE ATOMIC-FLUORESCENCE DETERMINATION OF MERCURY BY THE COLD VAPOUR TECHNIQUE,
Shandon Southern Instruments Ltd., Camberley (England).
For primary bibliographic entry see Field 05A.
W72-07175

CHARACTERIZATION OF INDOLES BY T?HIN-LAYER CHROMATOGRAPHY AND IN SITU FLUOROMETRY,
Dalhousie Univ., Halifax (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-07176

SUSPENDED MATTER IN THE CARIBBEAN SEA: A GRAVIMETRIC ANALYSIS,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 02J.
W72-07229

METHODS FOR ANALYSIS OF ORGANIC SUBSTANCES IN WATER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05A.
W72-07230

CARBON AND OXYGEN ISOTOPE EXCHANGE BETWEEN HCO3 IN SALINE SOLUTION AND SOLID CACO3,
Bundesanstalt fur Bodenforschung, Hanover (West Germany).
I. Wendt.
Earth and Planetary Science Letters, Vol 12, No 4, p 439-442, December 1971. 2 fig, 1 tab, 6 ref.

Descriptors: *Carbon radioisotopes, *Water chemistry, *Ion exchange, *Isotope fractionation, *Carbonates, Calcite, Sea water, Stable isotopes, Isotope studies, Radioactive dating.
Identifiers: *Isotope exchange.

Carbon isotope exchange between dissolved HCO3 and fine-grained solid CaCO3 in saline water was studied using radioactive carbon-14 as a tracer. An almost complete exchange was observed after 6 to 8 weeks contact of the two phases. Experiments with water enriched in O-18 showed that the oxygen isotopes exchange in the same way as the carbon isotopes. A fractionation value of +1.6 plus or minus 0.3 was obtained for CaCO3 and HCO3 in isotopic equilibrium at +14 deg C temperature. (Knapp-USGS)
W72-07231

ON THE EQUILIBRIUM OF COEXISTING SEDIMENTARY CARBONATES,
Hahn-Neitner-Institut fuer Kernforschung, Berlin (West Germany). Nuclear Chemistry Div.
For primary bibliographic entry see Field 02J.
W72-07232

INPUT AND OUTPUT OF MINERALS FOR A SMALL WATERCRESS BED FED BY CHALK WATER,
Freshwater Biological Association, Wareham (England). River Lab.
D. T. Crisp.
J Appl Ecol. 7 (1): 117-140. 1970. Illus.
Identifiers: Animal, Bed, Chalk, Fertilizer, Input, Minerals, Soil, Watercress-D.

An outline balance sheet for water and the elements Na, K, Ca, P and N was constructed for a small watercress bed at Doddings Farm, Bere Regis, Dorset. The bed had an area of 45 m2 and was fed by borehole water. The input in borehole water, soil, precipitation, fertilizer and cress material was measured and also the outputs in evaporation, water outflow, cress, animal material and soil. During the period 20 March 1967-4 July 1968 109 kg dry weight of cress material was taken from the bed and 37.5 kg was marketable. Evaporation and precipitation were negligible components of the water and element budgets. The input borehold water and the water flowing out of the bed were the most important means of entry and departure of Na, K, Ca and N. About 75% of the P input was a fertilizer and more than 10% of the output was as cress material. Disturbance to the bed through fertilizing or harvesting caused large fluctuations in the concentrations of elements in the out-flowing water over periods of 10-24 h following the disturbance. The P content of the output water reached peak values of up to 100 ppm after fertilizer application. The total outputs of Na, K, Ca and N in solution during the period of observation were similar to the inputs in solution but the outputs of P in solution was about 14 times the input as borehole water. Water from watercress beds might therefore have a significant effect upon the P economy of the streams into which it is discharged.--Copyright 1972, Biological Abstracts, Inc.
W72-07258

LITTER PHENOLICS OF POSSIBLE LIMNOLOGICAL IMPORTANCE IN SOUTHEASTERN ARIZONA,
Colorado Cooperative Fishery Unit, Fort Collins.
William J. McConnell, and Angela Longo.
J Ariz Acid Sci. 6 (4): 235-237. 1971.

identifiers: Arizona, Limnological, Litter, Phenolics, Quercus-Emoryi-D.

Analysis of phenolics of cold water extracts of new oak (Quercus emoyri) litter with polyamide columns indicated that 84% of the phenolic content consisted of tannins and 16% of non-tannin (monomeric) phenolics. Acid-formaldehyde precipitation ratios indicated that 29% of the phenolics present were leucocyanidin-catechin flavonoids; these were probably present largely as condensed tannins. Analysis of the non-tannin fraction with paper and thin layer chromatography revealed the presence of ellagic acid, protocatechuic acid, gallic acid, p-coumaric acid, quercetin, catechin, and vanillic acid plus 1 or 2 other unidentified vanillin related compounds.--Copyright 1972, Biological Abstracts, Inc.
W72-07261

2L. Estuaries

EMPIRICAL STUDY OF ECONOMIC-ECOLOGIC LINKAGES IN A COASTAL AREA,
Clemson Univ., S.C. Dept. of Agricultural Economics; and Georgia Inst. of Tech., Atlanta. Environmental Research Center.
For primary bibliographic entry see Field 06A.
W72-06585

ESTUARIES, BAYS AND COASTAL CURRENTS AROUND PUERTO RICO,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W72-06609

REGULATION AND OWNERSHIP OF THE MARSH LANDS: THE GEORGIA MARSHLANDS ACT.
For primary bibliographic entry see Field 06E.
W72-06639

LONGSHORE CURRENTS IN A SEMICIRCULAR BAY,
British Columbia Univ., Vancouver. Inst. of Oceanography.
J. C. O'Rourke, and P. H. LeBlond.
Journal of Geophysical Research, Vol 77, No 3, p 434-452, January 20, 1972. 5 fig, 9 ref. Nat Res Council of Canada Grant A7490.

Descriptors: *Waves (Water), *Bays, *Littoral drift, Currents (Water), Ocean waves, Surf, Mathematical studies, Refraction (Water waves), Turbulence.
Identifiers: Longshore currents.

The theory of wave-induced longshore currents is extended to curved semicircular beaches. The currents are produced by the nonvanishing mean lateral thrust exerted by the waves through the divergence of their radiation stress in the surf zone. The equations are linearized and only the retarding effect of bottom friction is taken into account. The origin and influence of the various forcing terms are discussed. As a rule, the dominant forcing term is the one caused by the obliquity of incidence of the waves at the breaker line. A general solution is found for a semicircular bay of radius of curvature much greater than the width of the surf zone and linear beach slope. A specific example is worked out for a given form of the incident wave field at the breaker line, with small, but nonuniform angle of incidence and wave amplitude along that line. (Knapp-USGS)
W72-06697

ADAPTATION OF ORGANISMS IN THE BRACKISH WATERS OF THE BALTIC (IN FINNISH),
Turku Univ. (Finland). Dept. of Zoology.
Kari Lagerspetz.
Luonnon Tutkija. 75 (3/4): 81-85. 1971. Illus. English summary.

Identifiers: Adaptation, Baltic, Brackish, Invertebrates, Mytilus-Edulis, Organisms, Oxidative, Phosphorylation.

The ecological physiology of the marine and freshwater organisms, especially invertebrates, of the brackish water of the Baltic is reviewed. It is suggested that the decreased growth and physiological activity as well as the increase of the tissue O2 consumption found in poikilosmotic euryhaline animals (e.g. Mytilus edulis) at low salinities are due to uncoupling of the oxidative phosphorylation caused by mitochondrial swelling.--Copyright 1971, Biological Abstracts, Inc.
W72-06738

GREAT LAKES REGION INVENTORY REPORT: NATIONAL SHORELINE STUDY.
Corps of Engineers, Chicago, Ill. North Central Div.
For primary bibliographic entry see Field 08A.
W72-06767

HEAVY METALS ANALYSES OF BOTTOM SEDIMENT IN THE POTOMAC RIVER ESTUARY,
Environmental Protection Agency, Annapolis, Md. Field Office.
For primary bibliographic entry see Field 05B.
W72-06772

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, DEEP SEA DRILLING PROJECT, LEG 7,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02K.
W72-06782

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, DEEP SEA DRILLING PROJECT, LEG 8,
Geological Survey, Woods Hole, Mass.; and Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02K.
W72-06783

MULTISPECTRAL PHOTOGRAPHIC REMOTE SENSING OF COASTAL ENVIRONMENTS,
Long Island Univ., Greenvale, N.Y. C. W. Post Center.
For primary bibliographic entry see Field 07B.
W72-06797

DATA ON THE ECOLOGY OF THE TAMAR ESTUARY, PLYMOUTH, ENGLAND,
Brussels Univ. (Belgium). Laboratoire de Botanique Systematique et d'Ecologie.
J. P.Mommaerts.
Bull Inst Roy Sci Natur Belg. 45 (22): 1-24. 1969. Illus. Maps. (Engl. summ).
Identifiers: Ecology, England, Estuary, Nutrients, Phyto, Plankton, Plymouth, Tamar.

The Tamar estuary was surveyed from March to Sept. 1968. The distribution and the variation of temperature, salinity and major nutrients (phosphate, nitrate and silicate) was studied and the connection with some water circulation features are discussed. The distribution of the various groups of phytoplankton in the estuary was investigated and compared with open sea data.--Copyright 1971, Bilogical Abstracts, Inc.
W72-06830

CONSTITUTIONAL IMPLICATIONS OF WETLANDS LEGISLATION,
For primary bibliographic entry see Field 06E.
W72-06874

OUR MARINE HERITAGE,
National Council on Marine Resources and Engineering Development, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-06905

RED SEA HOT BRINE AREA: REVISITED,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02K.
W72-06910

ZERO PADDING AS A MEANS OF IMPROVING DEFINITION OF COMPUTED SPECTRA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 07B.
W72-06924

ECONOMICS AND MANAGEMENT OF COASTAL ZONE RESOURCES,
George Washington Univ., Washington, D.C.
For primary bibliographic entry see Field 06B.
W72-06956

A POLICY ANALYSIS APPROACH: OBJECTIVES, ALTERNATIVE DEVELOPMENT STRATEGIES, AND ECONOMETRIC MODELS,
North Carolina Univ., Chapel Hill.
For primary bibliographic entry see Field 06B.
W72-06957

WATER QUALITY FOR PRESERVATION OF ESTUARINE ECOLOGY,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 06B.
W72-06969

WATER QUALITY FOR ESTUARINE ECOLOGICAL STABILITY,
Texas Univ., Austin.
For primary bibliographic entry see Field 06B.
W72-06970

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. II, COMPUTATION PROCEDURES,
New York City-Rand Inst., N.Y.
For primary bibliographic entry see Field 05B.
W72-06979

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. III, JAMAICA BAY SIMULATION,
New York City-Rand Inst., N. Y.
For primary bibliographic entry see Field 05G.
W72-06980

CASE STUDIES.
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06A.
W72-06989

PREDICTING CONSTRUCTION EFFECTS BY TIDAL MODELING,
Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-06996

PHYSICAL, CHEMICAL, AND BIOLOGICAL ASPECTS OF THE DUWAMISH RIVER ESTUARY, KING COUNTY, WASHINGTON, 1963-67,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-06998

ENGINEERING PROPERTIES OF SUBMARINE CALCAREOUS SOILS FROM THE PACIFIC,
San Diego State Coll., Calif. Dept. of Civil Engineering.
I. Noorany.

Available from the National Technical Information Service as COM-71 01149, $3.00 in paper copy, $0.95 in microfiche. Soil Mechanics Paper, 1971. 9 p, 5 fig, 3 tab, 10 ref. (Reprint from Proc of the International Symposium on the Engineering Properties of Sea-Floor Soils and Their Geophysical Identifications, Seattle, Wash, July 1971).

Descriptors: *Sedimentology, *Oceans, *Pacific Ocean, *Bottom sediments, *Calcium, Properties, Surveys, Sampling, Data collections, Moisture content, Pore pressure, Analytical techniques, Calcareous soils, Compressive strength.
Identifiers: Calcareous sediments.

The engineering properties of two white calcareous submarine sediments, sampled in water depths of 1,730 and 2,450 fathoms in the equatorial region of the Pacific Ocean were determined. The samples were good quality undisturbed samples obtained by a spade corer. Both sediments were calcareous, had water contents ranging from 84% to 116% and shear strengths ranging from 0.11 to 0.14 Kg/Sq cm. The general behavior of these calcareous sediments was similar to that of saturated clays. Although the soils had low plasticities, they exhibited sensitivities of 6.5 to 10.5 which are considerably higher than the values commonly reported for the submarine pelagic clays. Both sediments exhibited some initial resistances against compression, and their virgin compression behavior indicated compressibilities which were somewhat lower than that of plastic cohesive soils. (Woodard-USGS)
W72-07001

SIMULATION OF LONG WAVES IN BRANCHING WATERWAYS,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 02E.
W72-07019

ZONATION ON A TROPICAL SANDY SHORE,
Malaya Univ., Kuala Lumpur (Malaysia). School of Biological Science; and Malaya Univ., Kuala Lumpur (Malaysia). Div. of Ecology.
F. C. Vohra.
Journal of Animal Ecology, Vol 40, No 3, p 679-705, October 1971. 12 fig, 5 tab, 92 ref.

Descriptors: *Seashores, *Marine animals, *Ecological distribution, *Zoning, *Environmental effects, Saline waters, Temperature, Soil texture, Mode of action, Biological communities, Variability, Hydrogen ion concentration, Animal populations, Animal groupings.

A sheltered sandy shore of the Singapore seacoast was chosen as the site of an investigation of the zonation of the common macrofauna and the various environmental factors affecting the distribution of this fauna. Quantitative monthly faunistic samples were obtained at various time and tidal levels over 1 year from a set of collecting stations along a transect line set out across the shore and stations. A list of some 140 species inhabiting this region is presented. Bivalves and polychaetes form the bulk of the macrofauna, some of which were largely uniformly distributed while others demonstrated marked zonal patterns of distribution. Composites of salinity, temperature, pH, tidal coverage and soil texture gradation measurements indicated differences of physical conditions at different collecting points along the transect. Since salinity and temperature were more stable with depth, only surface animals have to cope with wide environmental variation and therefore develop appropriate adaptations. Most common surface animals were gastropods and the crucial adaptations were opercula. Animal zonation appeared to be closely linked to variations in temperature and time of exposure. (Casey-Arizona)
W72-07043

TIDAL FLUSHING SYSTEM,
For primary bibliographic entry see Field 05G.
W72-07092

TIDAL EXCHANGE AT GOLDEN GATE,
Brown and Caldwell, Inc., San Francisco, Calif.
For primary bibliographic entry see Field 05B.
W72-07227

OPAQUE MINERALS FROM THE SHELF SEDIMENTS OFF MANGALORE, WESTERN COAST, INDIA,
Geological Survey of India, Calcutta.
For primary bibliographic entry see Field 02J.
W72-07228

THE ANNUAL PRODUCTION BY PHYTOPLANKTON IN ST. MARGARET'S BAY, NOVA SCOTIA,
Bedford Inst., Dartmouth, (Nova Scotia).
Trevor Platt.
J Cons Cons Perma Int Explor Mer. 33 (3): 324-333. 1971. Illus. Map.
Identifiers: Annual, Bay, Canada, Carbon-14, Nova-Scotia, Phyto, Plankton, Production, St. Margarets, Weather.

The mean annual production by phytoplankton in St. Margaret's Bay, Nova Scotia, is estimated to be 190 gC/m2 yr. on the basis of 120 in situ 14C experiments made during the period June 1966 to June 1969. A method is described for the conversion of the results of short-term 14C experiments into daily and annual rates. No significant difference was found between the production at a station inside the bay and a station outside the bay. Annual variations in primary production were marked; much of the variation could be attributed to the influence of weather on the hydrographic regime of the bay.--Copyright 1972, Biological Abstracts, Inc.
W72-07262

SPECIES COMPOSITION AND ABUNDANCE OF NET PHYTOPLANKTON IN VIRGINIAN COASTAL WATERS, 1963-1964,
Benedict Estuarine Lab., Benedict, Md.
Richard A. Mulford, and John J. Norcross.
Chesapeake Sci. 12 (3): 142-155. 1971. Illus. Maps.
Identifiers: Abundance, Ceratium, Chaetoceros, Coastal, Composition, Phytoplankton, Rhizosolenia, Skeletonema, Species, Virginian.

A submersible pump was used to obtain samples of net phytoplankton at specific depths from three stations positioned across the continental shelf off Chesapeake Bay. The study, conducted for nine months, yielded information on the succession and abundance of diatoms and dinoflagellates. Species of the genus Ceratium were dominant in collections made in spring and summer, while Chaetoceros, Rhizosolenia and Skeletonema were most abundant during autumn. Compared to results of quantitative studies conducted elsewhere, the density of diatoms for all seasons studied was low. A severe drought prevailed in Middle Atlantic states prior to and during the course of the study. Though the nutrient cycle is not known for these waters, nutrient levels on the shelf were probably much depressed because of decreased river discharge.--Copyright 1972, Biological Abstracts, Inc.
W72-07264

SYNECOLOGY OF A VIRGINIA SALT MARSH,
Bureau of Sport Fisheries and Wildlife, Laurel, Md. Patuxent Wildlife Research Center.
James A. Kerwin, and Robert A. Pedigo.
Chesapeake Sci. 12 (3): 125-130. 1971. Maps.
Identifiers: Ecology, Elevation, Floristics, Marsh, Salt, Virginia.

In the spring and summer of 1964 a salt marsh in Gloucester County, Virginia, was analyzed using random quadrat sampling. Synthetic treatments were employed to evaluate data and were correlated with observed differences in elevation. Floristic data indicate the Virginia salt marshes show closer similarity to marshes north of Chesapeake Bay than those south of Chesapeake Bay. Correlation of floristic data with observed differences in evaluation indicates that zonation in the marsh is dependent upon differences in elevation or some environmental factor correlated with elevation differences. Observations of sedimentation and erosion in localized areas indicate that the marsh is in a constant state of change, with extensive areas undergoing both succession and regression.--Copyright 1972, Biological Abstracts, Inc.
W72-07271

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

MATERIALS EVALUATION PROGRAM,
Rice (Cyrus Wm.) and Co., Pittsburgh, Pa.
For primary bibliographic entry see Field 08G.
W72-06587

RESEARCH AND DEVELOPMENT OF NEW POLYMER SYSTEMS FOR REVERSE OSMOSIS MEMBRANES,
Aerojet-General Corp., El Monte, Calif.
C. W. Saltonstall, Jr., and W. S. Higley.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $0.45. Office of Saline Water Research and Development Progress Report No 360, October 1968. 66 p, 5 fig, 16 tab, 19 ref.

Descriptors: *Reverse osmosis, *Membranes, *Permselective membranes, Semipermeable membranes, Thin films, Brackish water, Desalination, Separation techniques, Polymers.
Identifiers: *Poly (Vinylene carbonate), Vinylene carbonate, Vinyl acetate, Nitrile.

Poly (vinylene carbonate), which was polymerized from the purified monomer, was evaluated in the form of thin or ultrathin films to demonstrate the high flux potential. To conserve the limited supply of polymer and to determine the effect of polymer molecular weight on the osmotic properties of the films, thin, knife-cast films were prepared from dilute solutions of the polymers and evaluated. Knife-cast films of 1.2 mu thickness or greater gave high salt retentions (85.2 to 98.2%) over 5.0 to 20.5 hours operation with 35,000 ppm feed solution at 1500 psi. Films of 0.71 to 0.76 mu thickness also exhibited high initial salt retentions (92.7 to 98% retention with 2.0 to 4.5 gfd flux) but showed increasing flux and decreasing salt retention with time and eventual loss of useful osmotic properties. Copolymers of vinylene carbonate were evaluated in an effort to obtain an internally plasticized membrane or film suitable for long-term reverse-osmosis service at 1500 psi. The vinylene carbonate/vinyl acetate copolymers in mole ratios of 5/1, 3.3/1 and 1.6/1 were evaluated. The tensile properties of the vinylene carbonate/vinyl acetate copolymers showed that the desired plasticizing properties were not obtained. The investigation of other new polymers included the evaluation of dense films of poly (diacetone acrylamide). A low salt permeability was exhibited, but the low product water flux obtained during reverse-osmosis testing was caused by extrusion of the film into the support because of its poor mechanical properties. Acetone soluble nitrile polymers and copolymers prepared from methacrylonitrile were investigated in an effort to utilize the highly polar nitrile group along with the outstanding strength and stability of these polymers. Acid hydrolysis of polymethacrylonitrile resulted in a modified polymer containing up to 9.5% carboxyl groups. Films of the hydrolyzed polymer gave calculated fluxes of 2.0 to 14.9 gfd (based on a 2500 A thickness) with salt retentions of 23 to 38%. Films

of a microcrystalline form of collagen were also evaluated for reverse-osmosis properties. Polymer blends of ethyl cellulose, 48.5% ethoxyl content, and poly (diacetone acrylamide) (PDAA) were investigated in an effort to obtain a film with a salt retention approaching that of ethyl cellulose but with increased water flux. The incorporation of 10% PDAA into ethyl cellulose resulted in films with salt retentions of 98.3 to 99.5%. (OSW abstract)
W72-06588

DEVELOPMENT REPORT NO. 5 SALINE WATER CONVERSION DEMONSTRATION PLANT NO. 1, FREEPORT, TEXAS,
Stearns-Roger Mfg. Co., Denver, Colo.
David D. Kays, Richard D. Rhinesmith, and Robert E. Bonvillian.
Office of Saline Water Research and Development Progress Report No 297, Sept 1967. 49 p, 5 fig, 15 tab. 14-01-001-218.

Descriptors: *Pumps, *Descaling, *Desalination plants, *Desalination apparatus, Evaporators, Heat transfer, Texas.
Identifiers: Falling-film evaporation, *Sea water conversion, Freeport (Tex).

Run 6 confirmed that Plant productivity is limited by pumping capability. Run 7 identified a scale-free operation using 30 per cent less evaporator surface and 280 deg heating steam temperatures. From these operations, it was determined that the Plant's potential productivity is 1.52 million gallons per day. At this level of operation, the total water cost would be 90.8 cents per 1,000 gallons. The anhydrite scaling limit in clean first effect tubes with recognized poor distribution lies between 272 deg F and 282 deg F with a normal (3.52%TDS) feed. After the tubes have been scaled once, the scaling limit is depressed to less than 275 deg F under the same distribution conditions and feed concentration. Anhydrite scale removal was very difficult and time consuming, and was probably not complete. Polyphosphate was effective in preventing gypsum scale deposition up to a blowdown concentration of 3.06 times normal sea water. Overall 'U's of 900 Btu/Hr-Ft2-deg F are possible in smooth tubes at 280 deg F. (OSW)
W72-06589

DEVELOPMENT OF CORROSION PROBES FOR SALINE WATER APPLICATIONS,
Batelle Memorial Inst., Richland, Wash. Pacific Northwest Lab.
V. F. Fitzpatrick.
Office of Saline Water, Research and Development Progress Report No 346, July 1968. 27 p, 38 fig, 14 ref. 14-01-0001-942.

Descriptors: *Desalination apparatus, *Corrosion, *Pitting (Corrosion).
Identifiers: *Corrosion probes, *Crovice corrosion, Galvanic attack, Resistance measurement, Polarization measurement, Galvanic couples, Copper-nickel, Carbon steel, Titanium.

Corrosion probes that will detect and measure galvanic and crevice corrosion by resistance and polarization measurements were developed. Probes were evaluated in ambient seawater and in laboratory and pilot plant studies to temperatures of 150 deg C. Data from the probe evaluation have provided some significant insight into the nature of galvanic attack. Commercial corrosion probes evaluated under similar conditions disclosed some problems in application. Present design of the end closure of resistance probes is unsatisfactory for use in saline water systems. Internal parts of aluminum probes were not sufficiently protected for use in saline water systems above 100 deg C. Metallurgical characteristics of the measuring element must be carefully specified when ordering probes. (OSW)
W72-06590

SCALE CONTROL WITH GRAPHITE HEAT--TRANSFER TUBES OF CONTROLLED PERMEABILITY TO STEAM,
Union Carbide Corp., Parma, Ohio.
L. E. Vaaler, and C. F. Hulswitt.
Office of Saline Water, Research and Development Progress Report No 272, July 1967. 51 p, 12 fig, 9 tab, 5 ref. 14-01-0001-685.

Descriptors: *Desalination apparatus, *Heat exchangers, *Calcium sulfate, Permeability, *Scaling.
Identifiers: *Heat transfer tubes.

Loop tests were run with 5.7% NaCl solution containing excess calcium sulfate (brine at 179-184 F) in a heat exchanger with both impervious and permeable graphite tubes. After 90 hr, a 3/16-in. thick sulfate scale was measured on impervious tube compared with 1/16-in. thick scale on permeable tube. Heat-transfer coefficient of the former decreased from 303 to 45 Btu/hr-sq ft-Deg F while that for permeable tube changed from 351 to 315. Runs were made (240 hr) with both tube types using 2.9% NaCl solution containing 1250 ppm calcium (as sulfate) in the brine. Average inlet and outlet temperatures were 181 and 212 F. Scale was heaviest in lower sections of both tubes. Impervious-tube scale was compact with dendritic whiskers. Scale in permeable tube was much thinner and smoother. Heat-transfer-coefficients behavior was similar to that in 90-hr runs. Tubes used were unusually heavy wall (1/4-in.) and were prepared by impregnating with resin and heating to 932 F to obtain desired permeability. Conclusions were - marked reduction in scaling with permeable graphite tubes and economic attractiveness of use of tubes in evaporators if scale formation can be prevented at high temperatures. (OSW)
W72-06591

EQUIPMENT COMPONENTS FOR LARGE EVAPORATOR PLANTS: A SUMMARY REPORT,
Oak Ridge National Lab., Tenn.
I. Spiewak, and B. E. Mitchell.
Office of Saline Water, Research and Development Progress Chart no 283, Nov. 1967. 117 p, 38 fig, 29 tab, 42 ref. 14-01-0001-534.

Descriptors: *Desalination plants, *Desalination apparatus, *Flash distillation, *Equipment, Evaporators, Condensers, Costs.
Identifiers: *Flash evaporators.

A summary of investigations to determine if components for large desalination plants could be obtained from industry. Included in these investigations were condenser tube bundles, condenser tubing, tubing fabrication methods, interstage tube seals, demisters, deaerators, deaerator jets and blowers, valves, and vapor compressors. It was concluded that suitable equipment was generally available with certain exceptions. More data are needed on material service lives. This can be obtained from model tests. Tubing cost reductions and reliability improvements are needed. Deaerator design technology is not advanced sufficiently to guarantee the required levels of oxygen and carbon dioxide. More detailed knowledge of flash chamber and condenser behavior is needed to eliminate unnecessary safety factors. Operating, dimensional, and cost data are provided for many of the components studied. (OSW)
W72-06592

TESTS TO PROVE PERFORMANCE OF HIGH TEMPERATURE WATER JET COMPRESSOR,
American Hydrotherm Corp., Long Island City, N.Y.
P. L. Geiringer, and L. T. Taylor.
Office of Saline Water, Research and Development Progress Report No 344, April 1968. 34 p, 20 fig. 14-01-0001-948.

Descriptors: Desalination, *Vapor compression distillation, Distillation, *Desalination processes.
Identifiers: *Vapor compressors, *Water jet compressors.

The design, construction, and testing of a high temperature water jet compressor to produce not more than 1.3 lb of compressed steam for each lb of suction steam using saturated water at 1010 psia as a driving medium when compressing steam from 20.5 to 25 psia. Test results reported show the actual performance was considerably better than the above. The tests proved that using 1010 psia saturated high temperature water, one lb of saturated steam can be compressed from 20.77 psia to 25.46 psia, while using 0.757 lb of high temperature water and producing only 1.26 lb of excess steam. The capacity of the test jet was 50,000 lb/hr of suction steam. It is expected that a further reduction of 10 to 20% in the amount of driving fluid required can be expected through a continuation of the test work. (OSW)
W72-06593

DEAERATOR EJECTORS AND BLOWERS FOR 50-MGD AND LARGER DESALINATION PLANTS,
Oak Ridge National Lab., Tenn.
S. C. Jacobs, B. E. Mitchell, and R. K. Sood.
Office of Saline Water, Research and Development Progress Report No 311, Nov 1967. 59 p, 10 fig, 12 tab, 6 ref. 14-01-0001-534.

Descriptors: *Desalination plants, *Desalination apparatus, *Coatings, Distillation, Flash distillation, *Deaeration.
Identifiers: *Deaerator ejectors.

A two-stage blower system with barometric condensers is the most economical centralized station arrangement for 50-Mgd plants. The optimum number of stages for ejectors is three. A precondenser should be used to reduce the amount of water vapor to be evacuated. Barometric precondensers and intercondensers are preferred to surface condensers because of lower capital cost, less severe service for materials, less use of cooling water, and significant reductions in pumping power because of lower pressure drop. A cascade type (high head loss) decarbonating pond used in this study proved to be uneconomical. However, a degassing pond of the low head loss (Weir) type may prove to be economical. Type 316 stainless steel should be useful up to 150 to 200 deg F. Hastelloy C is recommended for parts exposed to higher temperatures. The use of coatings, such as heresite, over less costly materials is also attractive. (OSW)
W72-06594

EVALUATION OF CONCRETE AND RELATED MATERIALS FOR DESALINATION PLANTS,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 08F.
W72-06595

HEATS AND ENTROPIES OF TRANSPORT OF IONS IN AQUEOUS SALINE SOLUTIONS,
Boston Coll., Chestnut Hill, Mass.
A. J. de Bethune.
Office of Saline Water, Research and Development Progress Report No 412, January 1969. 91 p, 8 fig, 17 tab, 41 ref. OSW Grant 14-01-0001-389.

Descriptors: *Thermodynamics, *Entropy, *Water properties, Temperature, *Aqueous solutions, *Ion transport.
Identifiers: *Calomel electrode potentials, *Temperature coefficients, Moving ion transport, Partition function.

The initial thermal temperature coefficient of the calomel electrode potential has been measured between 0 deg C and 70 deg C for aqueous 1.0, 0.1, and 0.01 m KCl, NaCl, LiCl, HCl and CaCl2. Experimental data are represented by quadratic equations, and least squares. Values of the quadratic constants are given. (OSW)
W72-06596

DEVELOPMENT REPORT ON HIGH TEMPERATURE ELECTRODIALYSIS, WEBSTER TEST FACILITY, WEBSTER, SOUTH DAKOTA,
Mason-Rust, Louisville, Ky.
John Nordin.
Office of Saline Water, Research and Development Progress Report No 342, June 1968. 129 p. 14-01-0001-1733.

Descriptors: *Electrodialysis, *Desalination processes, *Membranes, *Testing, South Dakota.
Identifiers: *Brackish water conversion, Webster (So Dak).

The purpose of this study was to determine the effects of temperature on the electrodialysis process equipment for brackish water conversion. Tests were run at 68, 80, 110 and 140 deg F. The major benefit of operation at 140 deg F as opposed to operation at 68 deg F or 50 deg F is in decreased power requirements, principally because of a decrease in Stackpack electrical resistance with increasing temperature. For example, at 50 deg F and I = 1.5 amperes (T.D.S. reduction from about 1290 PPM to 760 PPM), repeating cell pair (RCP) power expenditure is 1.55 KW-hr/103 gallons; at 140 deg F and I = 1.5 amperes, the RCP power expenditure is 0.56 KW-hr/103 gallons. Power expenditures for a variety of operating currents and temperatures are presented in graphical and tabular form in this report. The major contribution to the RCP resistance is from the dilution stream rather than the membranes, regardless of temperature. Graphs and tables specifying the individual area resistances (ohm-cm2) contributed by anion and cation membranes, dilution and concentrate streams as functions of temperature and operating current are presented in this report. No special problems or limitations occurred as a result of high temperature electrodialysis (up to 140 deg F), provided that polyethylene spacers are used below 110 deg F and block polymer spacers are used in the 110 deg F to 140 deg F range, and the flow channel linear velocity does not exceed 50 cm/sec. Prolonged use of polyethylene spacers at 140 deg F will cause deformation of the spacer straps and low limiting current values. (OSW)
W72-06597

CHEMICAL-ELECTRO-CHEMICAL CYCLE FOR DESALINATION OF WATER,
Atomic Energy Commission, Washington, D.C. (Assignee).
William C. Yee.
U. S. Patent No. 3,627,479, 2 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 893, No. 2, p 649, December 14, 1971.

Descriptors: *Patents, *Desalination processes, Scaling, *Electrochemistry, *Separation techniques, Methodology, Brines, Sea water.
Identifiers: Scale-forming materials, Alkaline scale.

The process consists of electrolyzing a concentrated brine to form NaOH, H2, and Cl2; combining at least a portion of the H2 and Cl2 to form HCL; and adding the HCl to the first portion of sea water in quantity to react with bicarbonate to produce CO2. NaOH is added to a second portion of the sea water to precipitate calcium carbonates. Evaporation procedures are used to deliver fresh water from the mixture formed. (Sinha-OEIS)
W72-06620

SYSTEM FOR THE DESALINATION OF SEA WATER,
Pierre Mahistre.
U. S. Patent No. 3,494,835, 3 p, 3 fig, 9 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 2, p 564, February 10, 1970.

Descriptors: *Patents, Desalination, Sea water, *Desalination apparatus, Distillation, *Desalination processes, Mechanical equipment.
Identifiers: Heat of vaporization, Inorganic salt.

Use is made of an 'open' refrigerating circuit operating with a small difference in absolute temperature between a hot source and a cold source. A constant level tank is open to the atmosphere and a barometric tube closed at the upper end has its lower end submerged in the water. A compressor lowers the pressure to draw sea water into the tank and feed vapor to a heat exchanger extending downward through the tube and feeding a fresh water run-off line. Inorganic salts are collected as a by-product. (Sinha-OEIS)
W72-07086

MULTISTAGE FALLING FILM FLASH EVAPORATOR FOR PRODUCING FRESH WATER,
Badger (W. L.) Associates, Inc., Ann Arbor, Mich. (Assignee).
Ferris C. Standiford, Jr.
U. S. Patent No. 3,494,836, 4 p, 3 fig, 12 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 2, p 565, February 10, 1970.

Descriptors: *Patents, *Desalination apparatus, *Evaporators, Brackish water, Sea water, Fresh water, Multistage flash evaporators, Separation techniques, *Flash distillation, *Desalination processes.
Identifiers: *Multistage flash evaporators.

The required heating length is shortened by causing the liquid being heated to flow as film across the heated surface under the influence of gravity. Boiling of the film is prevented by the presence of non-condensible gases. The gases are at a pressure at least equal to the maximum vapor pressure of the film, the inert gases containing carbon dioxide to prevent formation of scale. The feed water is heated through a wide temperature range in stages by vapor condensing at successively higher temperatures and absolute pressures. The heated feed water is heated further by an external source and then flashed down to successively lower absolute pressures, thereby supplying the vapor needed to heat the feedwater. The condensate of this vapor is the distilled water product. (Sinha-OEIS)
W72-07087

APPARATUS AND PROCESS FOR THE OSMOTIC SEPARATION OF WATER FROM A SALINE SOLUTION,
Morris Mendelson.
U. S. Patent No. 3,493,495, 4 p, 2 fig, 2 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 1, p 220, February 3, 1970.

Descriptors: *Patents, *Desalination apparatus, *Desalination processes, Separation techniques, *Osmosis, Sea water, Membranes, Permeability, Semipermeable membranes, Saline water, *Reverse osmosis, Fresh water, Mechanical equipment.
Identifiers: *Permeability cell.

A system is described that has a primary feed water circuit with high pressure, a low volume pump and a secondary feed water circuit with a low pressure, high volume pump. The high pressure pump delivers feed water into a permeability cell under a pressure of 1500 p.s.i. Fresh water permeates through a semi-permeable membrane in the cell. A residue of salts and minerals remains. The secondary feed water circuit is separated from the primary circuit by a valve. The low pressure pump delivers feed water at 50 p.s.i. into the first subchamber. The separating valve is opened periodically so that the pressure in both circuits is equal. The feed water in the first subchamber is delivered as a second stream into the cell where it mixes with the concentrated brine. The brine and salts are washed from the membrane and delivered to the storage area. (Sinha-OEIS)
W72-07091

REVERSE OSMOSIS SYSTEM,
North American Rockwell Corp., Canoga Park, Calif. (Assignee).
Arthur L. Kohl, and Frederick W. Poucher, Jr.
U. S. Patent No. 3,494,469, 3 p, 6 fig, 4 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 2, p 480, February 10, 1970.

Descriptors: *Patents, *Reverse osmosis, *Desalination apparatus, *Membranes, Saline water, Mechanical equipment, *Desalination processes.
Identifiers: Sealing methods, Tubular membranes.

Tubular reverse osmosis membranes and backing plates are assembled and retained in a stacked unit. A pressurized feed fluid introduced into the system is constrained to flow through an internal fluid volume defined by the tubular membrane. A backup structure reduces the distance the fluid must travel and reduces pressure losses. The system does not require internal product water collection channels thus permitting extremely close spacing of adjacent membrane tubes. (See also W72-07094) (Sinha-OEIS)
W72-07093

REVERSE OSMOSIS SYSTEM,
North American Rockwell Corp., Canoga Park, Calif. (Assignee).
Arthur L. Kohl.
U. S. Patent No. 3,494,468, 3 p, 5 fig, 5 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 2, p 480, February 10, 1970.

Descriptors: *Patents, *Reverse osmosis, *Desalination apparatus, Saline water, *Membranes, *Desalination processes, Mechanical equipment.
Identifiers: Collector trays.

Collector trays are assembled in a stacked unit and positioned within a pressure vessel. The system provides a maximum area of useful membrane surface per unit volume of high pressure containment. The total distance that the product fluid must travel through the backing material is substantially reduced over that of other systems. (See also W72-07093) (Sinha-OEIS)
W72-07094

3B. Water Yield Improvement

METHODS OF ANALYSIS AND DETERMINATION OF EFFECTS OF ALTERNATIVE USES OF FORESTED LAND ON STREAMFLOW,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 04C.
W72-06606

COLORADO RIVER BASIN PILOT PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Denver, Colorado. Engineering and Research Center.

Available from the National Technical Information Service as PB-201 086-F, $3.00 in paper copy, $0.95 in microfiche. May 28, 1971. 31 p, 1 map, 1 chart.

Descriptors: *Artificial precipitation, *Cloud seeding, *Snowfall, Weather modification, Cloud physics, Water supply, Weather, Weather forecasting, Weather data, Climatic data, Meteorological data, Weather patterns, Colorado, Silver iodide, Snow.
Identifiers: *Environmental impact statements, *San Juan Mountains (Colo).

The project is a test of large-scale cloud seeding techniques for increasing snowfall in mountainous areas. A 1,300 square mile target area of the San Juan Mountains will be utilized. The project's main objective is to provide scientific and engineering evaluations of snowfall increases, and is justified by recent advances in winter cloud seeding. Present evidence does not suggest dramatic ecological consequences. Extensions in the snow-

melt season and mountain snowpack retention may not be proportional to increased snow and may be relatively short. Avalanche potential and silver concentrations will be assessed. Alternative experimentation sites have been eliminated for a variety of specified reasons. No long range or irreversible effects are anticipated. Seeding suspensions and concurrent ecological monitoring will tend to prevent any short-range ecological effects. Comments of concerned agencies are included. (Earl-Florida)
W72-06646

PECOS RIVER BASIN WATER SALVAGE PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Amarillo, Tex.

Available from the National Technical Information Service as PB-201 253-D, $3.00 in paper copy, $0.95 in microfiche. June 1971. 54 p.

Descriptors: *Phreatophytes, *Brush control, *Texas, *New Mexico, *Water yield improvement, *Environmental effects, United States, *Tamarisk, Riparian plants, Arid lands, Consumptive use, Water table, Water utilization, Groundwater, Legal aspects, Competing uses, Federal government, State governments, Project planning, Birds, Nests, Federal project policy, Reclamation, Vegetation effects, Water conservation.
Identifiers: *Environmental impact statements, *Pecos River Basin.

The Pecos River Basin Water Salvage Project is designed for the removal and control of nonbeneficial vegetation, principally saltcedar. The elimination or control of dense stands of these plants will prevent nonbeneficial use of a vast amount of water. This will allow the water table to rise. Thus, a significant amount of water would be salvaged for human uses in an area which has experienced a critical shortage of water. The predicted hunting and fishing losses which would be caused by complete removal of all phreatophytes have been minimized by leaving selected areas, such as river fringes and fence rows, undisturbed. Disruption of nesting areas for the mourning dove is a major concern. Alternatives to the project include the following: (1) delaying the project, (2) substituted plantings, (3) clearing only heavy infestations, and (4) no project at all. No resources would be irreversibly committed. The comments of concerned organizations are set forth. (Johnson-Florida)
W72-06648

THE COMPARATIVE WATER ECONOMY OF REPRESENTATIVE EVERGREEN SCLEROPHYLL AND DROUGHT DECIDUOUS SHRUBS OF CHILE,
Stanford Univ., Calif. Dept. of Biological Sciences; and Universidad Catolica de Chile, Santiago. Laboratorio de Botanica.
For primary bibliographic entry see Field 02I.
W72-06702

RECOVERY OF DESERT PLANTS IN VARIOUS STATES OF VIGOR,
Colorado State Univ., Fort Collins. Dept. of Range Science.
For primary bibliographic entry see Field 04A.
W72-06703

WARM FOG MODIFICATION STUDIES,
Meteorology Research, Inc., Altadena, Calif.
T. B. Smith, A. I. Weinstein, C.-W. Chien, and D. M. Takeuchi.
Available from NTIS, Springfield, Va. 22151 as AD-733 671, $3.00 paper copy, $0.95 microfiche. Final Contract Report AFCRL-71-0467, MRI 71-978, August 1971. 96 p, 36 fig, 15 tab, 8 ref. 7605,8620 Task No. 760501,862005, Contract No. F19628-70-C-0069.

Descriptors: *Weather modification, *Fog, *Aircraft, *Analytical techniques, *California, Cloud seeding, Condensation, Computer models, Hydrologic data, Data collections, Meteorology.
Identifiers: *Fog dissipation, Hygroscopic seeding.

A series of field experiments were carried out to investigate the treatment of warm fogs by hygroscopic materials. Fourteen tests were made in the Noyo River Valley in northern California using a DC-3 aircraft and a helicopter to dispense hygroscopic material at the fog top. Extensive ground instrumentation recorded the effects of the treatment. Other tests were conducted using C-130 aircraft and an Air Force helicopter. Some of the test results illustrated include Water Mass Distribution, Time History of Total Water Mass, and Time History of Droplet number. Computer model calculations support the results of the field programs and strengthen the physical understanding of the processes involved. (Woodard-USGS)
W72-06786

THE EFFECT OF SHELTER ON THE TEMPERATURE AND MOISTURE OF DESERT SANDS,
All-Union Scientific Research Inst. for Agroforestry Amelioration, Moscow (USSR).
A. M. Stepanov.
Soviet Geography: Review and Translation, Vol 12, No 10, p 695-701, December 1971. 4 tab, 5 ref. Transl. from Problemy Osvoyeniya Pustyn' 1969, No 4.

Descriptors: *Arid lands, *Windbreaks, *Shelterbelts, *Soil temperature, *Soil moisture, Barriers, Air circulation, Plant growth, Dunes, Sands, Stabilization, Water conservation, Wind velocity, Slopes.

The role of desert mechanical shelter is usually associated with a desire to reduce wind speeds in the surface layer, prevent sand drifting and protect plants against wind erosion. Its significance with respect to moisture accumulation and conservation is generally ignored. Investigations in the Kara-Kum Desert on mechanical shelters, including covering sand binders and standing windbreaks, revealed that such structures reduced wind speed in the surface layer resulting in an attenuation of sand drifting. At midday, the shelters reduced sand temperatures by as much as 2.5 degrees C on south-facing slopes and by about twice as much on north-facing slopes. Combinations of slope and windward and lee sides of barriers were even more effective. The stabilized dunes lost 60% less moisture. Standing windbreaks did not produce sand desiccation. The lee side on south-facing slopes and the windward side on north-facing sand dune slopes were the areas of decreased sand temperature combined with increased moisture that resulted in optimal plant growth. (Casey-Arizona)
W72-07044

WEATHER MODIFICATION OPERATIONS IN CALIFORNIA: OCTOBER 1, 1968 - SEPTEMBER 30, 1969.
California State Dept. of Water Resources, Sacramento.

Bulletin 16-69, June 1970. 14 p, 11 fig, 11 tab, 1 ref.

Descriptors: *Climatic data, *Rainfall, *Precipitation (Atmospheric), *Fog, *Weather modification, Airports, Silver iodide, Sodium chloride, California, Mapping.
Identifiers: *Fog dispersal.

From October 1, 1968 through September 30, 1969, 9 licensees conducted weather modification projects in California. As a precipitation-increasing attempt, 7 of the licensees distributed silver iodide in some form. Each project area map is presented with relevant data on number of attempts, flights, storms and amount of silver iodide. Additionally, 2 fog dispersal projects which were conducted at the Sacramento Metropolitan Airport and the Los Angeles International Airport, attempted to improve runway visibility on cloudy or foggy days. The majority appeared successful. A precipitation map is presented for the state of California covering the study year. (Casey-Arizona)
W72-07053

WATER CONSERVATION SIGNIFICANCE OF FOREST STANDS UNDER THE CONDITIONS OF TIEN SHAN, (IN RUSSIAN),
P. N. Matveev.
Lesovedenie. 4. 3-8. 1969. (Engl. summ.).
Identifiers: Accumulation, Betula-Verrucosa-D, Conservation, Forest, Larix-Sibirica-G, Physical, Pinus-Sylvestris-G, Precipitation, Snow, Soil, Spruce-G, Stands, Tien-Shan, USSR.

Water conservation properties of artificial stands were studied in young closed plantations of Larix sibirica, Pinus sylvestris, and Betula verrucosa, on forest clearings, and in natural spruce forests. The canopy of Larix plantations shuts out 30.7% of the precipitation, that of pine -34.3% and that of birch -21.4%; spruce in the spruce forest shuts out 65%. The highest amount of snow is accumulated in larch plantations (82.9 mm), then in birch plantations (69.9 mm) and in pine plantations (34 mm); in the spruce forests only 22 mm of snow are accumulated during the winter. Forest plantations differ advantageously from the natural spruce stands regarding the distribution of precipitation. They also improve the hydrophysical properties of soil.--Copyright 1971, Biological Abstracts, Inc.
W72-07116

3C. Use of Water of Impaired Quality

RESPONSE OF BEAN PLANTS TO SODIUM CHLORIDE AND SODIUM SULPHATE SALINIZATION,
Volcani Inst. of Agricultural Research, Rehovoth (Israel); and Hebrew Univ., Jerusalem (Israel).
A. Meiri, J. Kamburoff, and A. Poljakoff-Mayber.
Annals of Botany, Vol. 35, No. 4, p. 837-847, 1971. 2 fig, 9 tab, 15 ref.

Descriptors: *Plant physiology, *Osmotic pressure, *Anions, *Cations, *Water balance, Sodium, Chlorides, Sulfates, Laboratory tests, SALINE WATERS, Metabolism, Plant growth.
Identifiers: *Relative water content.

Bean plants were grown on control (-0.7 bar), weak (-2.2) or strong (-3.7) salinities of NaCl or Na sulfate. The effects of changing salinities were also studied for the strong and control sulfate solutions. At isosmotic concentrations of the salts, there were no significant changes in dry-weight accumulations or leaf area increases, and therefore no differences in growth. Relative water content of the plants was also the same in response to isosmotic concentrations of the salts. Salinity adjustments were much slower with the sulfate solution and never did become complete. Sap Cl ions reached much higher levels in Cl solutions than sulfate ions in sulfate solutions and resulted in higher sap electrical conductivities implying differences in the mechanisms of osmotic adjustment, which were slower with sulfate salinity. Differences in transpiration rate reductions were also apparent, with Cl solutions resulting in a greater reduction. The differences in the plant responses to the 2 different types of treatment were probably due to the anions, but the differences in Na ion concentrations cannot be ignored either. (Casey-Arizona)
W72-06701

SOIL SALINIZATION AND WELSH SETTLEMENT IN CHUBUT, ARGENTINA,
Alberta Univ., Edmonton. Dept. of Geography.
For primary bibliographic entry see Field 04A.

W72-06714

EFFECT OF SALINITY ON GROWTH OF A SALT MARSH GRASS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 02I.
W72-06719

THE EFFECT OF SODIUM CHLORIDE ON SOME PHYSIOLOGICAL GROUPS OF MICROORGANISMS INHABITING A HIGHLY SALINE SOIL,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture; and Hebrew Univ., Rehovoth (Israel). Dept. of Phytopathology and Microbiology.
For primary bibliographic entry see Field 02I.
W72-07036

WATER RELATIONS AND GROWTH OF COTTON AS INFLUENCED BY SALINITY AND RELATIVE HUMIDITY,
Agricultural Research Service, Riverside, Calif. Soil and Water Conservation Research Div.; and California Univ., Riverside. Dept. of Statistics.
G. J. Hoffman, S. L. Rawlins, M. J. Garber, and E. M. Cullen.
Agronomy Journal, Vol 63, No 6, p 822-826, November-December 1971. 4 fig, 4 tab, 17 ref.

Descriptors: *Cotton, *Salt tolerance, *Leaves, *Transpiration, *Plant growth, Plant root systems, Pollen, Laboratory tests, Temperature, Humidity, Crop production, Soil-water-plant relationships, Osmotic pressure, Water balance.
Identifiers: *Plant water potential, *Relative humidity.

Previous research has indicated interactive effects between soil salinity and relative humidity (RH) in bean plant growth. This interaction was studied in growing cotton plants in 4 sunlit climate chambers. The chambers were controlled at 25, 40, 65 and 90% RH. Plant root media were maintained at osmotic potentials of -0.4, -5, -10 and-15 bars in the climate chambers. Shoot growth increased by 40% in the 90% RH atmosphere and was unaffected at other RHs. High RHs caused at least a doubling of the root/shoot ratio. Seed cotton yields were at field yield levels only in the 40 and 65% climates because the flowers did not undergo another dehiscence at the extreme RHs. Transpiration per unit leaf area ratio increased about 80% at all salinity levels as the RH decreased from 90%. With humidity a constant, it decreased slightly with salinity increase. Plant age was also a factor in transpiration levels, causing decreases with increasing age. Since the yields of dry matter as a function of salinity did not vary with RH, it appeared that there was no interaction between salinity and RH. This was reinforced by the same results with leaf area as a function of salinity at different relative humidities. (Casey-Arizona)
W72-07058

THE CHAC PLAN: IRRIGATION STRUCTURE IN AN UNDERDEVELOPED REGION OF PECULIAR ECOLOGY IN THE STATE OF YUCATAN (EL PLAN CHAC: OBRA DE RIEGO EN UNA REGION SUBDESARROLLADA Y DE ECOLOGIA PARTICULAR, EN EL ESTADO DE YUCATAN).
Secretaria de Recursos Hydraulicos, Mexico City. Direccion de Pequena Irrigacion.
For primary bibliographic entry see Field 08A.
W72-07061

ROLE OF MG IN THE FORMATION OF SOLONETZIC SOILS ON IRRIGATION WITH MINERALIZED WATERS,
T. K. Vorotnyk.
Ahrokhim Hruntozn Resp Mizhvid Temat Nauk Zb. 10. 86-96. 1969. (Russ. summ.).
Identifiers: Formation, Irrigation, Magnesium, Mineralized, Soils, Solonetzic, USSR.

In the southern Ukraine and in the Donbas, irrigation with mineralized waters produces Na or Na-Mg solonetzization of soils. A detailed examination of the nature of Na-Mg salinity in irrigated soils is presented. Mg ions take an active part in solonetzization of soils irrigated with waters containing approx 25% Mg salts and approx 50% Na salts.--Copyright 1971, Biological Abstracts, Inc.
W72-07113

STUDIES ON THE QUALITY OF UNDERGROUND WATERS OF BHILWARA AND CHITTORGARH DISTRICTS OF RAJASTHAN, (IN JAPANESE),
Rajasthan Univ., Jaipur (India). Dept. of Agriculture.
D. L. Sharma, L. N. Sharma, and B. L. Darra.
Ann Arid Zone. 9 (4): 1970. 229-235. English summary.
Identifiers: Acidity, Alkalinity, Bhilwara, Chittorgarh, Districts, India, Irrigation, Rajasthan, Soil, Underground.

The water table depths of 25% of the wells crossed the safe limits (2 m) in the monsoon season. Waters of 25% of the wells are of medium, 60% high and 15% very high salinity classes; 92% fall under the low and 8% under the medium alkalinity classes. Irrigation with these waters should be supplemented with cultural treatments: farmyard manure, town compost, green manuring, gypsum or any other suitable soil ameliorators. The soils might deteriorate in the course of irrigation unless a good drainage system is provided.--Copyright 1971, Biological Abstracts, Inc.
W72-07270

3D. Conservation in Domestic and Municipal Use

EMPIRICAL STUDY OF ECONOMIC-ECOLOGIC LINKAGES IN A COASTAL AREA,
Clemson Univ., S.C. Dept. of Agricultural Economics; and Georgia Inst. of Tech., Atlanta. Environmental Research Center.
For primary bibliographic entry see Field 06A.
W72-06585

PHYSICAL AND FINANCIAL MASTER PLANNING,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 06B.
W72-06889

THE SYSTEMS APPROACH IN URBAN PLANNING,
Barton-Aschman Associates, Inc., Chicago, Ill.
For primary bibliographic entry see Field 06A.
W72-06947

WATER REQUIREMENTS OR WATER DEMANDS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 06D.
W72-06952

REGIONALISM - SENSE AND SAVINGS,
Central Connecticut State Coll., New Britain. Dept. of Economics; and State Univ., of New York, Albany.
For primary bibliographic entry see Field 06C.
W72-07115

RECENT CASES OF WATER-UTILITY LIABILITY,
National Inst. of Municipal Law Officers, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-07202

3E. Conservation in Industry

ECONOMIC AND ENVIRONMENTAL EVALUATION OF DEVELOPMENT ALTERNATIVES FOR BEAUFORT COUNTY, SOUTH CAROLINA,
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 06B.
W72-06605

TWO METHODS OF STUDYING THE EFFECT OF MUNICIPAL SEWER SURCHARGES ON FOOD PROCESSING WASTES,
North Carolina State Univ., Raleigh. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W72-06976

3F. Conservation in Agriculture

A NOTE ON CRITERION FOR SELECTION OF IRRIGATION PROJECTS,
A. Chatterjee.
Economic Affairs, Vol 16, No 1-2, p 79-85, January/February, 1971.

Descriptors: *Irrigation programs, *Water resources development, *Cost-benefit analysis, Financial analysis, Direct benefits, Indirect benefits, Discount rate.
Identifiers: *Discounted cash flow, India.

The traditional financial criterion for selection of Indian irrigation projects has been the 'productivity test.' An irrigation scheme was deemed 'productive' and qualified for selection if the net return from the project was sufficient to repay the prescribed annual interest charges on the capital invested. Ideally, such projects would not impose any burden on the state treasury after their completion. This criterion focuses only on financial return; it does not take into account the direct and indirect returns flowing to the community from an irrigation project. Consequently, the 'benefit-cost' criterion has been evolved in modern economic theory to provide a correct guideline to public policy makers. The 'benefits' from an irrigation project can be divided into direct and indirect primary benefits and direct and indirect secondary benefits. However, in the calculation of 'benefits,' only direct primary benefits from the irrigation schemes are taken into account. A more sophisticated method of calculation of benefit-cost ratios evolved in recent times is the discounted cash flow method of computing the returns from a project. Under this method the costs and the benefits are reduced to a common time basis for present worth through the adoption of appropriate discount rates. (Settle-Wisconsin)
W72-06581

AGRICULTURE'S EFFECT ON NITRATE POLLUTION OF GROUNDWATER,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 05B.
W72-06598

WATER POLLUTION POTENTIAL ESTIMATED FROM FARM NUTRIENT BUDGETS,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 05B.
W72-06676

RESPONSE OF BEAN PLANTS TO SODIUM CHLORIDE AND SODIUM SULPHATE SALINIZATION,
Volcani Inst. of Agricultural Research, Rehovoth (Israel); and Hebrew Univ., Jerusalem (Israel).
For primary bibliographic entry see Field 03C.

W72-06701

PREDICTED FORAGE YIELD BASED ON FALL PRECIPITATION IN CALIFORNIA ANNUAL GRASSLANDS,
California Univ., Hopland. Hopland Field Station.
For primary bibliographic entry see Field 04A.
W72-06704

RAINFALL PATTERN AND MONTHLY FORAGE YIELDS IN THAL RANGES OF PAKISTAN,
Pakistan Forest Inst., Peshawar.
For primary bibliographic entry see Field 04A.
W72-06705

RANGE MANAGEMENT AND IMPROVEMENT IN NEW ZEALAND,
For primary bibliographic entry see Field 04A.
W72-06708

POPULATION, AGRICULTURE AND FOOD SUPPLY IN LATIN AMERICA,
Calgary Univ. (Alberta). Dept. of Geography.
A. Gonzalez.
Cahiers de Geographie de Quebec, No. 35, p. 332-343, September, 1971. 4 tab, 7 ref.

Descriptors: *Productivity, *Human populations, *Agriculture, Foreign lands, Irrigation, Food abundance, Diets, Cereal crops, Geographical regions, *Regional analysis.
Identifiers: *Latin America, *Developing regions, *Productivity increases, *Overpopulation.

Of the world's underdeveloped regions, Latin America is the most advanced. The share of agriculture in the gross domestic product of most countries is declining. The percentage of agricultural laborers in the work force is slowly decreasing as is agriculture's share of export earnings, although it is still the biggest export category. During the 1950's and 1960's agricultural production increased at the rate of about 3% annually, which just kept pace with population increase. Only 3 nations (Venezuela, Bolivia and Chile) are net food importers. Therefore the region constitutes an agricultural and food surplus region. A review of nation-by-nation per capita dietary intake reveals calory and protein levels that are low but significantly higher than those in the rest of the underdeveloped world. Most of the increases in agricultural yield have been through expansion rather than intensification. At present only about one-twentieth of the arable land is under irrigation and considerable future increases will be necessary in order to obtain high yields inherent in the new crop varieties. The green revolution will have a great impact on the region. (Casey-Arizona)
W72-06712

MONTHLY VARIATION IN THE CHEMICAL COMPOSITION OF DESERT SALTBUSH,
California Univ., Riverside. Dept. of Agronomy; and California Univ., Riverside. Agricultural Extension Service.
For primary bibliographic entry see Field 02I.
W72-06713

SOIL SALINIZATION AND WELSH SETTLEMENT IN CHUBUT, ARGENTINA,
Alberta Univ., Edmonton. Dept. of Geography.
For primary bibliographic entry see Field 04A.
W72-06714

LONGEVITY OF BUFFEL GRASS SEED SOWN IN AN ARID AUSTRALIAN RANGE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Rangelands Research Unit.
For primary bibliographic entry see Field 04A.
W72-06715

EVALUATION OF LATENT EVAPORATION ESTIMATES AND THEIR CONVERSION TO POTENTIAL EVAPORATION,
Department of Agriculture, Ottawa (Ontario). Plant Research Inst.
For primary bibliographic entry see Field 02D.
W72-06716

GRAZING IN THE MIDDLE EAST: PAST, PRESENT, AND FUTURE,
Food and Agriculture Organization of the United Nations, Tehran (Iran).
C. K. Pearse.
Journal of Range Management, Vol. 24, No. 1, p. 13-16, January 1971. 4 fig, 13 ref.

Descriptors: *Grazing, *Livestock, *Range management, *Environmental effects, *Depletion, Ranges, Conservation, Stocking, Arid lands.
Identifiers: *Middle East.

Historical and recent developments of livestock grazing in the Middle East are reviewed, with conclusions drawn on future phenomena and solutions for current problems. Native rangelands were grazed by domestic livestock about 11,000 years ago. Locally heavy and early grazing occurred for many millennia with only limited environmental impact. Unmanaged grazing (over-stocking) increased greatly within the last century, resulting in a serious regional depletion. Lack of management is due to a lack of appreciation of the seriousness of the problem and lack of desire to act, not to lack of technical, legal or administrative basis for action. Future technical assistance should emphasize local understanding of the range problem. Assistance should reinforce local determination to find workable management solutions. (Popkin-Arizona)
W72-06717

SOIL AND GRAZING INFLUENCES ON A SALT-DESERT SHRUB RANGE IN WESTERN COLORADO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04A.
W72-06720

STOCKING RANGELANDS ON THE RIO PUERCO IN NEW MEXICO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
E. F. Aldon, and G. Garcia.
Journal of Range Management, Vol 24, No 5, p 344-345, Sept. 1971. 4 ref, 3 tab.

Descriptors: *Ranges, *Stocking, *Range management, *Forages, *Crop production, Range grasses, Grasslands, Regression analysis, Computer programs, New Mexico.
Identifiers: *Semiarid lands.

Guidelines were developed for stocking semidesert ranges in New Mexico, particularly along Rio Puerco drainage. Stocking tables were distilled from 12-years data on stocking levels, utilization percentages, and perennial grass forage production on the San Luis Experimental Watersheds in the Rio Puerco basin. Tables were developed by computing multiple regression of utilization, production and stocking level. A basic language computer program is available to make stocking contributions. The program outputs stocking levels in animals per square mile. (Popkin-Arizona)
W72-06721

WATER MANAGEMENT ASPECTS OF CONSOLIDATING IRRIGATION SYSTEMS,
Colorado State Univ., Fort Collins.
G. V. Skogerboe.
Paper, American Society of Civil Engineers, Irrigation and Drainage Division Special Conference, Lincoln, Nebr, Oct 1971. 23 p, 2 fig.

Descriptors: *Irrigation systems, *Water management (Applied), Water utilization, Agriculture, Municipal water, Industrial water, Flood control, Economics, Aesthetics, Fish and wildlife, Water supply, Water budget, Social aspects, Political aspects, Consolidation, *Evaluation, Surface irrigation, Analysis.
Identifiers: Water-use study.

Irrigated agriculture has not reached full potential because of the generally inflexible and static nature of established irrigation systems, as contrasted with the dynamic changes in population, industrialization, and water uses. Uses constantly competing for water are: municipal, industrial, pollution abatement, flood control, power, fish and wildlife habitat, recreation, and aesthetics. Irrigation can successfully meet this competition by being constantly alert to technical, social, and institutional advancements and practices which will improve system efficiency and conserve water. The history and physical development of western irrigation systems are reviewed. Emphasis is placed on water management in discussing consolidation of irrigation systems. To evaluate the engineering, legal, and sociological factors affecting the consolidation of irrigation systems, 8 irrigated valleys in the intermountain west were studied. An imaginative water resource program and an efficient and effective water management policy are necessary to meet the challenges of growth and make adjustments resulting from new and expanding demands. (USBR)
W72-06742

UNTAPPED RESERVES IN IRRIGATION,
Azovo-Chernomorskii Selskokhozyaistvennyi Institut, Rostov-na-Donu (USSR).
N. S. Timchenko.
Soviet Hydrology-Selected Papers, No 1, p 69-79, 1970. 8 fig, 5 tab, 10 ref.

Descriptors: *Irrigable land, *Irrigation water, *Irrigation practices, *Runoff, *Waste water, *Melt water, Water resources, Irrigation, Irrigated land, Irrigation efficiency, Irrigation effects, Irrigation systems, Return flow, Irrigation operation and maintenance, Crop yield, Water management (Applied).
Identifiers: Irrigated agriculture, USSR.

The effective use of water for irrigated agricultural lands is becoming a highly acute problem in Russia. 200,000 to 400,000 hectares are underirrigated because of water shortages at irrigation sources. Each year, about 60 billion cu m, or 60%, of all the water collected is lost through discharge, percolation, and evaporation. This water would irrigate 2 to 2.5 million more hectares of land. In addition, about 50 to 60 billion cu m of water is lost in runoff from the arid agricultural areas. Since 1965, the Novocherkassk Engineering-Reclamation Institute has been studying the irrigation systems in Rostov Province and the use of melt water, waste water and water released from canals on additional irrigated areas. The test areas are described and crop yields of areas irrigated by discharge and melt water are compared with those on unirrigated land. In an area with combined use of melt water, discharge water and unused water from the canals, the land produces 2 fodder crops per year and the crop yield is 5 to 6 times greater than on unirrigated land. (USBR)
W72-06755

PESTICIDES IN WATER: RESIDUES IN PONDS TREATED WITH TWO FORMULATIONS OF DICHLOBENIL,
Agricultural Research Service, Prosser, Wash. Irrigated Agriculture Research and Extension Center.
For primary bibliographic entry see Field 05B.
W72-06773

THE ENERGY BUDGET AT THE EARTH'S SURFACE: WATER RELATIONS AND STOMATAL RESPONSE IN A CORN FIELD,
Agricultural Research Service, Ithaca, N.Y. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02I.
W72-06791

IRRIGATION INVESTIGATIONS IN OTAGO, NEW ZEALAND, IV. PHYSICAL PROPERTIES OF SOILS OF THE ARROW BASIN AND UPPER CLUTHA VALLEY,
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.
For primary bibliographic entry see Field 02G.
W72-06825

EFFECT OF VARIOUS BEDDINGS ON THE QUALITY OF FARMYARD MANURE: I. FARMYARD MANURE FROM EARTH LITTER,
Cairo Univ. (Egypt). Faculty of Agriculture.
For primary bibliographic entry see Field 05C.
W72-06826

ECONOMICS OF A WATER-YIELD FUNCTION FOR SUGAR CANE,
Economic Research Service, Honolulu, Hawaii. Natural Resource Economic Div.
H. C. Hogg, J. R. Davidson, and Jh. Chang.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 95, No. IR1, p 127-138, March, 1969. 2 fig, 3 tab, 5 ref, 5 append.

Descriptors: *Economics, *Irrigation, *Irrigation practices, *Water balance, *Water demand, *Water yield, Evaporation pans, Management, Sugar cane.

An aggregate water deficiency model developed to isolate the relationship between water and sugar cane yield is presented along with the empirical results of a specific application to plantation data. The usefulness of the model as a basis for dealing with a number of economic problems in irrigation management is demonstrated in both a theoretical and an empirical analysis. (Skogerboe-Colorado State)
W72-06832

NITROGEN ECONOMY OF CROPPED AND UNCROPPED FLOODED RICE SOILS UNDER FIELD CONDITIONS,
The International Rice Research Inst., Los Banos, Laguna (Philippines).
V. V. Racho, and S. K. De Datta.
Soil Science, Vol. 105, No. 6, p 419-427, June, 1968, 6 fig, 2 tab, 23 ref.

Descriptors: *Nitrogen, *Fertilization, *Flood irrigation, Crop production, Rice, Nitrogen cycle, Crop response, *Soil chemistry.

Most of the mineral nitrogen present in a flooded Maahas clay was ammonium nitrogen. Although the amount at transplanting was closely related to the amount of nitrogen fertilizer added, the amount in all treatments at harvest was similar, suggesting that there was no carry-over of fertilizer nitrogen, irrespective of rates of application, for a succeeding rice crop. Substantial amounts of mineral nitrogen remaining in the soil at harvest represent a reserve for use by a subsequent crop provided the soil is kept submerged in the interim. The data indicate that if adequate fertilizer nitrogen is incorporated before transplanting, it should not be necessary on this soil to apply further nitrogen at the panicle primordium initiation stage of an early maturing, lodging-resistant rice variety. Considerable quantities of nitrogen were unaccounted for a harvest and the amount increased with fertilizer application. These discrepancies remain unexplained and indicate the need for further research. Plant nitrogen analyses suggested that rate of nitrogen fertilizer application did not affect the removal of soil nitrogen by the rice crop. Estimated fertilizer recovery by the plant decreased with increased fertilizer application. (Skogerboe-Colorado State)
W72-06833

APPLIED NITROGEN LOSSES IN RELATION TO OXYGEN STATUS OF SOILS,
Agricultural Research Service, Brawley, Calif. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05B.
W72-06835

SPRAY IRRIGATION TREATMENT,
American Potato Co., Moses Lake, Wash.
For primary bibliographic entry see Field 05D.
W72-06858

THE ROLE OF WATER IN RESOURCES DEVELOPMENT,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 06B.
W72-06960

HYDROGEOLOGY OF A PLAYA NEAR AMARILLO, TEXAS,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 04B.
W72-07004

UTILIZATION OF THE ALGA SPIRULINA AS A PROTEIN SOURCE,
Instituto Nacional de la Nutricion, Mexico City.
For primary bibliographic entry see Field 02H.
W72-07048

WATER RESOURCES IN THE UKRAINIAN S.S.R., PRESENT AND FUTURE,
Ukrainian National Committee for the International Hydrological Decade, Kiev (USSR).
For primary bibliographic entry see Field 06D.
W72-07056

ENERGY BALANCE AND WATER USE OF RICE GROWN IN THE CENTRAL VALLEY OF CALIFORNIA,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 02D.
W72-07057

WATER RELATIONS AND GROWTH OF COTTON AS INFLUENCED BY SALINITY AND RELATIVE HUMIDITY,
Agricultural Research Service, Riverside, Calif. Soil and Water Conservation Research Div.; and California Univ., Riverside. Dept. of Statistics.
For primary bibliographic entry see Field 03C.
W72-07058

A VISUAL IRRIGATION GUIDE FOR MAIZE (ZEA MAYS L.),
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
L. A. Downey.
Agronomy Journal, Vol 63, No 6, p 887-889, November-December 1971. 6 fig, 17 ref.

Descriptors: *Irrigation practices, *Timing, *Corn (Field), *Soil-water-plant relationships, *Water balance, Soil moisture, Plant growth, Photosynthesis, Turgidity, Semiarid climates, Humidity, Vapor pressure, Air temperature.
Identifiers: *Relative water content, *Soil water potential, *Soil matric potential, *Irrigation timing.

Photosynthesis, and therefore plant growth, is a measure of the water balance of the plant. A 90% relative plant water content (RWC) is a critical level below which photosynthesis drops off very quickly. Irrigations should be timed so that crop moisture deficits do not fall below the critical level. RWC for maize can be estimated from leaf turgidity using standardized photographs. In a variable semiarid environment, vapor pressure deficit (VPD) and RWC are related and may be graphed. This graph then provides a useful guide to irrigation need in maize. Since VPD is very difficult to measure, an empirical relationship between VPD and air temperature can be used to construct an air temperature-RWC graph as a guide to irrigation need. Its use has proven quite practical in Griffith, N.S.W., a semiarid region. (Casey-Arizona)
W72-07059

THE CHAC PLAN: IRRIGATION STRUCTURE IN AN UNDERDEVELOPED REGION OF PECULIAR ECOLOGY IN THE STATE OF YUCATAN (EL PLAN CHAC: OBRA DE RIEGO EN UNA REGION SUBDESARROLLADA Y DE ECOLOGIA PARTICULAR, EN EL ESTADO DE YUCATAN).
Secretaria de Recursos Hydraulicos, Mexico City. Direccion de Pequena Irrigacion.
For primary bibliographic entry see Field 08A.
W72-07061

PROFILE MODIFICATION AND ROOT YIELD, DISTRIBUTION, AND ACTIVITY,
Southwestern Great Plains Research Center, Bushland, Tex.
H. V. Eck, and R. G. Davis.
Agronomy Journal, Vol. 63, No. 6, p. 934-937, November-December 1971. 2 fig, 2 tab, 18 ref.

Descriptors: *Plant root systems, *Crop response, *Productivity, *Root development, *Root distribution, Soil moisture, Soil profiles, Sodium, Carbonates, Strontium radioisotopes, Agronomic crops.

Drastically altering a soil profile with a root-impeding layer may alter root yield and distribution with depth. The effects of deep plowing or profile modification on root distribution have been little studied. Characterization of root systems and root penetration measurements are difficult. In this study, deep plowing and Na carbonate application for reducing radiostrontium uptake were compared by sampling from 4 crops with the objective of determining treatment effects on root yield and distribution and of examining relationships between root yields and root activity as indicated by the top-root ratios and Sr-35 uptake. Deep plowing decreased root yields of sudangrass, sugar beets and soybeans but had little effect on cabbage roots. Yields decreased with depth on soil rototilled to 20 cm but tended to be evenly distributed throughout the 90 cm profile when 22,400 kg/ha of sodium carbonate was applied at a 90 cm plow depth. Root activity was definitely enhanced by profile modification. Sr-35 activity indicated that roots in the 70-90 cm root zone were as active as roots in the 10-20 cm zone. (Casey -Arizona)
W72-07062

EFFECT OF SEEDBED CONFIGURATION AND COTTON BUR MULCH ON LINT COTTON YIELD, SOIL WATER, AND WATER USE,
Agricultural Research Service, Soil and Water Conservation research Div. Big Spring, Tex.
P. T. Koshi, and D. W. Fryrear.
Agronomy Journal, Vol. 63, No. 6, p. 817821, November-December 1971. 4 fig, 7 tab, 11 ref.

Descriptors: *Cotton, *Dry farming, *Mulching, *Water conservation, *Cultivation, Furrows, Semiarid climates, Texas, Great Plains, Rainfall, Water storage, Soil moisture, On-site investigations.
Identifiers: *Seedbed configurations.

Dryland agriculture in the Southern High Plains depends on the most efficient use of available water. Droughts are frequent and the low humidity, high temperatures and wind velocity result in high evapotranspiration. Approximately 30% of the harvested cotton accumulates at the cotton gin as cotton burs or gin trash and may be returned to the cotton fields for mulch. This study was designed to determine the influences of 3 seedbed configurations (flat, ridge and furrow) and 3 mulch rates (5.6, 11.2 and 22.4 tons/ha) on soil water accretion and depletion under cotton on a moderately sandy soil in a semiarid climate. Preseason soil water storage, as measured by neutron scattering, was directly proportional to amount of bur mulch, as were precipitation storage efficiencies. Furrow plots had the highest accretion, and ridge plots, generally, the lowest. All results held true for 2 crop years, 1968 and 1969. Yields were highest and similar for the 11.2 and 22.4 tons/ha plots, but were also significantly greater for the 5.6 ton/ha plots as compared to the plots with no mulch. (Casey-Arizona)
W72-07066

OPTIMAL SYSTEMS DESIGNING FOR EFFICIENCY IN KASHMIR'S RENEWABLE RESOURCE USE,
Sardar Patel Univ., Vallabh Vidyanagar (India).
For primary bibliographic entry see Field 06A.
W72-07118

INFLUENCE OF SOIL PROPERTIES AND CULTURAL PRACTICES ON EVAPORATION OF WATER FROM SOIL,
Clemson Univ., S. C. Water Resources Research Inst.
For primary bibliographic entry see Field 02D.
W72-07128

EFFICIENCY OF CERTAIN EROSION-CONTROL PRACTICES DURING PRIMARY TILLAGE IN THE ROSTOV REGION, (IN RUSSIAN),
For primary bibliographic entry see Field 04D.
W72-07274

STUDIES OF THE TRANSFORMATION OF N FERTILIZERS IN IRRIGATED SOIL, (IN RUSSIAN),
For primary bibliographic entry see Field 02G.
W72-07277

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

APPLICATION OF A DIGITAL HYDROLOGIC SIMULATION MODEL TO PIEDMONT WATERSHEDS,
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 02A.
W72-06602

BALANCED STORM DRAINAGE, (STORM DRAINS FOR ROADWAYS),
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 08B.
W72-06604

MATHEMATICAL MODELS FOR THE PREDICTION OF TEMPERATURE DISTRIBUTIONS RESULTING FROM THE DISCHARGE OF HEATED WATER INTO LARGE BODIES OF WATER,
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 05B.
W72-06613

WEED PUMP,
M. P. Chaplin.
U. S. Patent No. 3,626,675, 5 p, 11 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 893, No. 2, p 447, December 14, 1971.

Descriptors: *Patents, *Weed control, Harvesting, Weeds, *Aquatic weed control, Lakes, Rivers, Ponds, Crops, Mechanical equipment, *Pollution abatement.
Identifiers: *Weed pump, *Harvesting marine growths.

This disclosure provides an improvement of the patent entitled 'Harvesting Marine Growths', Ser. No. 798066 filed Feb 10, 1969, known as Pat. No. 3,546,858. A method and apparatus for removing growths from a body of water and of processing them into a usable product were presented. The device now is designed to replace the submerged opening, the suction pump through which the weed passes, and the separating screen. The weed pump is not capacity limited and involves a self-propelled floating structure. Weeds are dewatered enabling a large amount of waterfront property or waterway to be cleared at minimum cost. (Sinha-OEIS)
W72-06631

FLOOD CONTROL IMPROVEMENT ON ESOPUS CREEK AT KINGSTON, NEW YORK; HUDSON RIVER, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 08A.
W72-06645

STONEWALL JACKSON LAKE, WEST FORK RIVER, WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 08A.
W72-06647

PECOS RIVER BASIN WATER SALVAGE PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Amarillo, Tex.
For primary bibliographic entry see Field 03B.
W72-06648

RIDGECREST WASH CHANNEL, KERN COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Los Angeles, Calif.

Available from the National Technical Information Service as PB-198 901-F, $3.00 in paper copy, $0.95 in microfiche. April 1971. 26 p, 1 plate, 4 photo.

Descriptors: *Flood control, *Storm runoff, *California, *Flood protection, *Environmental effects, United States, Flood routing, Federal government, Legal aspects, Nonstructural alternatives, Project planning, Project purposes, Federal project policy, Project benefits, Flood plain zoning, Channels, Floodways, Levees, Environmental engineering, Aesthetics.
Identifiers: *Environmental impact statements, *Kern County (Calif).

The project would provide flood protection to residential, commercial, and public property in Ridgecrest, California and to federal property at China Lake. It consists of a channel which would intercept storm runoffs and direct them to a dry lake. The area's climate, economic development, land use, vegetation, wildlife, land features, water features, historical features and points of interest, and recreational use are described. The project would also: (1) have a detrimental effect on the natural aesthetics of the area by leaving an obvious scar on the landscape, and (2) result in some loss of vegetation and disruption of wildlife. The project would have no significant effect on groundwater percolation and quality. The project would also enable future development to encroach upon the channel. This might result in future ecological problems relating to wildlife habitat, water demand, and waste disposal. Alternatives include different locations for the channel, flood plain zoning, and doing nothing. Comments received from governmental and private entities are set forth. (Johnson-Florida)
W72-06649

LOWER KLAMATH RIVER FLOOD CONTROL PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 08A.
W72-06650

BERWIND SNAGGING AND CLEARING PROJECT, DRY FORK OF TUG FORK OF BIG SANDY RIVER, WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-201 376-F, $3.00 in paper copy, $0.95 in microfiche. July 1971. 16 p.

Descriptors: *Channel improvement, *Flood control, *West Virginia, *Environmental effects, United States, Drainage systems, Federal government, State governments, Economics, Project planning, Water resources development, Project benefits, Project purposes, Cost-benefit analysis, Federal project policy, Aesthetics, Environmental engineering, Construction, Silting, Bank stability, Channel flow, Streams, Surface drainage, Flood damage, Flood protection.
Identifiers: *Environmental impact statements, *Big Sandy River (WVa).

The proposed flood protection project consists of snagging and clearing to provide partial flood protection for a community situated on the channel's flood plain. The project would remove all undergrowth, drift, and snags from the banks and the channel and clear brush and trees on banks for a distance of 35 feet. The final statement further describes the project and the environmental setting without the project. The major impact of the project would be an increase in the discharge capacity of the channel, resulting in a reduction of headwater flooding. Adverse environmental effects include the following: (1) increased degradation of bed and banks immediately upstream, because of a small increase in stream flow velocity; (2) minor increases in flood stages immediately downstream; and (3) a change in the area's aquatic ecology. Alternatives, some of which singly or in combinations may be feasible, include upstream watershed management, dam construction, levee construction, channelization, easements, zoning regulations, and floodproofing or relocation of improvements. The proposed plan is the optimum plan. (Johnson-Florida)
W72-06651

RECOVERY OF DESERT PLANTS IN VARIOUS STATES OF VIGOR,
Colorado State Univ., Fort Collins. Dept. of Range Science.
C. W. Cook, and R. D. Child.
Journal of Range Management, Vol. 24, No. 5, p. 339-343, September 1971. 1 fig, 2 tab, 14 ref.

Descriptors: *Xerophytes, *Range management, *Deterioration, *Environmental effects, *Arid lands, Ranges, Plant populations, Utah, Measurement, Forages, Browse utilization, Range grasses, Seasonal, Treatment, Vegetation establishment, Crop production, Effects, Soil-water-plant relationships.

Identifiers: *Plant recovery, *Plant vigor, Clippings, Intermountain basin.

Desert ranges of intermountain basins must be used correctly to maintain ecological balance. Changes in plant vigor precede changes in botanical composition and range deterioration. A study was conducted from 1959 to 1968 in desert ranges of western Utah to determine the recovery of desert range plants during three years and at three different intensities during four seasons. Plant vigor measurements were taken for seven years to determine recovery from previous treatments. Relevant literature is reviewed. Dominant forage species studied include three browse, two suffrutescent and two grass species. Amount of live crown cover was closely correlated with herbage yield. Effects of previous seasonal clippings and intensity of clippings are discussed. The lower the vigor of an individual species, the longer the recovery period. Plants clipped heavily during any season or harvested moderately during late spring, or twice a year, in winter and again in late spring, differed significantly in vigor from untreated plants after seven years of protection. (Popkin-Arizona)
W72-06703

PREDICTED FORAGE YIELD BASED ON FALL PRECIPITATION IN CALIFORNIA ANNUAL GRASSLANDS,
California Univ., Hopland. Hopland Field Station.
A. H. Murphy.
Journal of Range Management, Vol. 23, No. 5, p. 363-365, September 1970, 1 tab, 11 ref.

Descriptors: *Forecasting, *Forages, *Crop production, *Precipitation, *Grasslands, Autumn, Annual, California, Soils, Soil-water-plant-relationships, Temperature, Rainfall, Plant growth.

Yearly forage yields on annual grasslands differ considerably. Precipitation data were used as a basis for early forecasting of herbage yields of California ranges. Yield and precipitation information over a 16 year period for a range of eleven soil series was analyzed. Yields reflect interaction of temperature, precipitation, and time of germinating rainfall. Initiation of fall forage growth depends on the first half-inch of effective rainfall. Annual forage yield depends on the amount of precipitation received by the third week in November. Then, a determination can be made as to the expected annual yield in terms of low, medium or high. (Popkin-Arizona)
W72-06704

RAINFALL PATTERN AND MONTHLY FORAGE YIELDS IN THAL RANGES OF PAKISTAN,
Pakistan Forest Inst., Peshawar.
Ch. M. Khan.
Journal of Range Management, Vol. 24, No. 1, p. 66-70, January 1971, 4 fig, 4 tab, 3 ref.

Descriptors: *Rainfall, *Environmental effects, *Ranges, *Grasslands, Range management, Arid lands, Loess, Alluvium, Forages, Crop production, Monsoons, Seasonal, Correlation analysis, Regression analysis, Limiting factors, Soil-water plant relationships.
Identifiers: *Rainfall pattern, Variance, Thal (Pakistan), Pakistan.

Rainfall and its pattern were considered the principal environmental factors influencing Thal ranges of Pakistan. Thal ranges are desert grasslands or desert savanna occurring on eolian and alluvial deposits characterized by July-September monsoon rains and lesser spring rains. This study determines relationships between monthly forage production and monthly rainfall, previous monthly rainfall, number of rainy days during the month, and month of growing season. Precipitation and forage information were collected, and partial and stepwise multiple correlation and regression analyses were made. The correlation matrix is illustrated. Variance was also analyzed. Monthly rainfall and number of rainy days within the month were of primary importance to forage. Dhaman was more responsive than karera to all rainfall factors. (Popkin-Arizona)
W72-06705

RANGE MANAGEMENT AND IMPROVEMENT IN NEW ZEALAND,
W. R. Chapline.
Journal of Range Management, Vol. 24, No. 5, p. 329-333, September 1971, 4 fig, 9 ref.

Descriptors: *Range management, *Range grasses, *Ranges, *Deterioration, *Watershed management (Applied), Islands, Pastures, Forests, Crops, Turf grasses, Legumes, Sheep, Cattle, Surface runoff, Erosion, Burning, Controls, Soil conservation, Land development.
Identifiers: *New Zealand, Southern Hemisphere, Scrub, Rabbits.

New Zealand consists of two large and many small islands in the Southern Hemisphere. One-third of the country is improved pasture, comprised of large areas of scrub, native forest, and reseeding crops. Improved pastures are seeded to turf-forming grasses and legumes; fertilized by air; and intensely managed for wool, lamb, mutton and beef. Wool production is paramount. Ranges were seriously deteriorated following excessive runoff and erosion, resulting from heavy rabbit infestation and crop burning. Rabbits are now controlled; burning is largely eliminated; better range and livestock management is applied. Improved pastures, high country grazing, watershed management and soil conservation, and land development are discussed. (Popkin-Arizona)
W72-06708

PHENOLOGY, COMMUNITY COMPOSITION, AND SOIL MOISTURE IN A RELICT AT AUSTIN, TEXAS,
Saint Edward's Univ., Austin, Tex.
D. Lynch.
Ecology, Vol. 52, No. 5, p. 890-897, 1971. 3 fig, 4 tab, 11 ref.

Descriptors: *Subhumid climates, *Soil moisture, *Grasslands, *Drought, *Vegetation effects, Grasses, Trees, Biological communities, Precipitation (Atmospheric), Ecological distribution, Ecosystems, Texas, On-site investigations, Environmental effects.
Identifiers: *Soil depth.

The grassland of the Austin, Texas area suffered from a 7-year drought which ended in 1957. After the drought a vegetation analysis of the region was made. The springs of 1960 and 1961 were unusually dry although rains later came. Irregularities in vegetation, especially among annuals, cannot be explained by mean annual precipitation or even by mean monthly precipitation. This study was undertaken to compare the mosaic pattern existing between 2 grassland communities at the end of the drought in 1956 to their vegetation composition in 1963 and 1964, after 4 years of above-normal, if somewhat variable precipitation. In the year after the drought, all vegetative activity rose and fell with soil moisture. This study showed no such relationship after the above-average rainfall years. The Andropogon scoparius community came to be almost completely composed of the dominant, with the less competitive species crowded out. The grass-forb community saw invasion by A. scoparius and replacement of the dominant, Aristida longiseta by other grass species, and an invasion of woody species, principally Baccharis salincina and Juniperus ashei. This community lies within an ecotone between the Andropogon community and an oak-juniper woodland. The position of the ecotone appears to be a function of soil moisture and depth. The Andropogon community possesses deeper soils, and in rainy years, Andropogon invades the grass-forb community along a gradient of decreasing soil depth. (Casey-Arizona)
W72-06710

SOIL SALINIZATION AND WELSH SETTLEMENT IN CHUBUT, ARGENTINA,
Alberta Univ., Edmonton. Dept. of Geography.
J. F. Bergmann.
Cahiers de Geographie de Quebec, No. 35, p. 361-369, September 1971. 3 fig, 7 photos.

Descriptors: *Irrigation practices, *Saline soils, *Arid lands, *Drainage, *Social aspects, Foreign lands, Crop response, Economic feasibility, Canal seepage, Groundwater, Dams.
Identifiers: *Waterlogging, *Argentina.

In July, 1965, a band of 153 Welsh settlers landed on the shore of Chubut, located in the arid Patagonian region of Argentina. They soon discovered the potential for crop irrigation from the Chubut River. Unfortunately, their largely urban backgrounds from humid Wales left them little prepared to deal with the complexities of arid region irrigation systems. The canal system was poorly constructed, the fields were poorly leveled and irrigation water application and drainage were inadequately controlled. By the turn of the century, soil salt accumulations began curtailing agricultural productivity. The major reasons for the rises in salinity were canal seepage and crop overwatering combined with a highly saline groundwater. The Welsh farmers have consistently refused to improve their drainage facilities and water application practices. They have viewed local drainage problems as the responsibility of the munocipalities. Of the 40,000 ha originally irrigated only about 18,000 ha are left in cultivation. Reclamation projects in the region will probably be limited by the low economic value of crop production in the Chubut Valley. (Casey-Arizona)
W72-06714

LONGEVITY OF BUFFEL GRASS SEED SOWN IN AN ARID AUSTRALIAN RANGE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Rangelands Research Unit.
R. E. Winkworth.
Journal of Range Management, Vol 24, No. 2, p. 141-145, March 1971, 19 ref., 1 fig., 1 tab.

Descriptors: *Longevity, *Range management, *Ranges, *Range grasses, *Arid lands, Crop production, Seeds, Rainfall, Germination, Varieties, Soil-water-plant relationships.
Identifiers: Australia, Buffel grass.

Seedlings of perennial grasses occur in arid areas after 'good rains.' Infrequent occurrence of germination periods means that seed of successful species remains alive for long periods. The question of seed longevity in an arid Australian range is investigated. Three sets of buffel grass seed were sown and sampled at increasing time intervals, and their germinability compared to laboratory stored seeds. All seed lost dormancy more rapidly in soil than storage. Sixty percent of laboratory-stored seeds germinated, while ten percent of soil seeds germinated in 2-4 years after sowing. The 10 percent longevity of buffel grass seed in soil is sufficent to conclude that range seeding of adaptive varieties of this grass can be attempted with confidence in seed longevity. (Popkin-Arizona)
W72-06715

SOIL AND GRAZING INFLUENCES ON A SALT-DESERT SHRUB RANGE IN WESTERN COLORADO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
G. T. Turner.
Journal of Range Management, Vol 24, No 1, p 31-37, January 1971. 3 fig, 3 tab, 8 ref.

Descriptors: *Grazing, *Xerophytes, *Soils, *Vegetation effects, *Ranges, Range management, Conservation, Arid lands, Colorado, Sur-

face runoff, Sediment yield, Shrubs, Livestock, Winter, Deterioration, Stocking, Sandstones, Shales, Drought, Sites, Precipitation, Soil-water-plant relationships.

Runoff is sediment laden, and plant cover of the salt-desert shrubs is sparse in western Colorado. Vegetation and ground-cover responses to winter livestock grazing and to livestock exclusion for 10 years were observed. Soils were derived from shale and sandstone. Changes in soil-vegetation relationships, attributable to grazing, were small. Reductions in galleta, shadscale and snakeweed were attributed to drought. Responses of Salina wildrye, Gardner saltbrush, Greenes rabbitbrush and annual plants were ascribed to grazing. Low site capability and subnormal precipitation were responsible for the general lack of vegetation response to livestock exclusion. (Popkin-Arizona)
W72-06720

THE FORESTS OF JORDAN,
Libya Univ., Benghazi; and Durham Univ. (England). Dept. of Geography.
K. Atkinson, and P. Beaumont.
Economic Botany, Vol 25, No 3, p 305-311, July-September, 1971. 2 fig, 12 ref.

Descriptors: *Forests, *Semiarid climates, *Browse utilization, *Soil erosion, Lumbering, Precipitation (Atmospheric), Trees, Mountains, Natural resources, Land use, Foreign lands, Ecosystems.
Identifiers: *Middle East, *Jordan, *Dry forests.

The cedar stands of Lebanon are historically, the most famous of the forested areas of the Levant, but other forested areas of the region, though less famous, still remain of vital importance. Discontinuous areas of natural forest are located in the catchments of the wadis flowing into the main rift valley of the River Jordan. The forests of the northern highlands are of a greater extent than those of the southern highlands. In the north the critical limit for tree growth approximates the 400 mm mean annual isohyet. The southern forest occurs under conditions of considerably lower rainfall and greater marginality. Five associations of trees may be distinguished in the northern forests and 2 associations in the south. In both the north and south the forests have contracted greatly from what were much vaster wooded areas and considerable areas of the present-day forested regions are treeless and degraded. Goat overgrazing has been cumulative and is probably one of the major reasons for the decline of the forests. Cultivation of vines, wheat and olives has removed the continuous canopy and exposed large areas to soil degradation to the point that the forest cannot ever be refurbished. Forest ecosystems in such arid areas are brittle and easily disrupted. Other reasons for their decline include indiscriminate logging, the barking of oak roots for tannin, wood collection for fuel and possible greater climatic aridity. (Casey-Arizona)
W72-06723

APPRAISAL OF STREAMFLOW IN THE TUALATIN RIVER BASIN, WASHINGTON COUNTY, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 02E.
W72-06771

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1970,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W72-06774

PROBABILITY FORECASTS OF WATER SURFACE TEMPERATURES OF THE ST. LAWRENCE RIVER BETWEEN KINGSTON, ONTARIO AND SOREL, QUEBEC,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
R. Y. Poulin, J. R. Robinson, and D. F. Witherspoon.
Technical Bulletin No 46, 1971. 18 p, 7 fig, 6 tab, 4 ref.

Descriptors: *Water temperature, *River forecasting, *St. Lawrence River, *Ice, *Navigation, Model studies, Streamflow, Water levels, Air temperature, Meteorological data.
Identifiers: Ice formation.

The methods used in the development of a water surface temperature model and the derivation of a method of forecasting water surface temperatures are outlined for the St. Lawrence River. From the results of the study, forecasts of water surface temperatures, from which freeze-up dates on the St. Lawrence River can be inferred, are practicable. The use of currently available monthly forecasts of levels and flows combined with Airborne Radiation Thermometer (ART) data and forecasts of air temperature, provide the necessary data for forecasting water surface temperatures. The data are important for navigational activities on the river. (Woodard-USGS)
W72-06778

IN HYDROLOGY H IS A HOUSEHOLD WORD,
Thomas J. Watson Research Center, Yorktown Heights, N.Y.
J. R. Wallis, and N. C. Matalas.
Preprint, presented at International Symposium on Mathematical Models in Hydrology, Warsaw, Poland, July 26-31, 1971; International Association for Scientific Hydrology, p 375-393, 1971. 7 fig, 8 ref.

Descriptors: *Mathematical models, *Synthetic hydrology, *Reservoir operations, Markov processes, River systems, Reviews, Statistical methods, Equations, Design data, Hydrology, Model studies.

In the design of long-term storage reservoirs, the range of cumulative departures from the mean provides a measure of the reservoir design capacity. To generate synthetic flow sequences similar in hydrologic persistence to historical flow sequences, generating processes other than Markovian must be used. Hydrologic persistence, the tendency for high flows to follow high flows and for low flows to follow low flows, is attributed to atmospheric storage or to storage in the drainage basin, either surface or subsurface. The importance of persistence is felt in the design of reservoirs, where required storage capacity varies directly with the persistence inherent in the reservoir inputs. Empirical correlograms subjectively reflect long-term persistence, yet objective tests for serial dependence fail to do so because of biases in the estimates of the test statistics as well as the inherent low power of the test. To generate synthetic flows, resemblance between historical and synthetic sequences requires the use of values for statistical characteristics that are different from those extracted from the historical sequences. (Woodard-USGS)
W72-06785

OPERATIONAL HYDROMET DATA MANAGEMENT SYSTEM--DESIGN CHARACTERISTICS.
North American Rockwell Information Systems Co., Anaheim, Calif.
For primary bibliographic entry see Field 07A.
W72-06793

LONG-TERM RUNOFF FLUCTUATIONS OF THE VOLGA RIVER (MNOGOLETNIYE KOLEBANIYA STOKA VOLGI),
For primary bibliographic entry see Field 02E.
W72-06805

DRAINAGE WITH PERFORATED PLASTIC TUBING,
Forest Hydrology Lab., Wenatchee, Wash.
G. O. Klock, L. Boersma, D. G. Watts, and R. H. Brooks.
Agronomy Journal, Vol. 61, No. 1, p 56-58, January-February, 1969, 3 fig, 1 tab, 4 ref.

Descriptors: *Drainage, *Subsurface drainage, *Alfalfa, *Manganese, *Water table, Crop response, Plastic pipes.
Identifiers: Plastic tubing.

The feasibility of placing drains at shallow depths and close together to improve drainage conditions on a planosol was evaluated. Field lysimeters were obtained by surrounding soil blocks with vertical sheets of heavy plastic penetrating well into the impermeable subsoil. Perforated plastic tubing placed 22.5 feet (approx. 6.9 m) apart at a depth of 20 inches (approx. 51 cim) provided adequate drainage. Dupuit alfalfa yielded better than 10 T/A dry matter. Manganese levels were below concentrations considered toxic. When a spacing of 45.0 feet (approx. 13.7 m) was used, the alfalfa yields were above levels considered toxic. (Skogerboe-Colorado State)
W72-06834

LEGAL ASPECTS OF DRAINAGE IN NEW ENGLAND: A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 06E.
W72-06869

ARON V. CITY OF PHILADELPHIA (INADEQUACY OF MUNICIPAL SEWER IN EXCEPTIONAL INSTANCES).
For primary bibliographic entry see Field 06E.
W72-06896

CHANNEL MOVEMENT OF MEANDERING INDIANA STREAMS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W72-06913

POLICY TOWARD FLOOD PLAIN MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 06B.
W72-06965

APPLICATION OF OPERATIONS RESEARCH TECHNIQUES FOR ALLOCATION OF WATER RESOURCES IN UTAH,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 06A.
W72-06972

A TECHNIQUE FOR SMOOTHING RIVER FLOWS DURING HYDROELECTRIC POWER PRODUCTION,
Auckland Univ., (New Zealand). Dept. of Theoretical and Applied Mechanics.
R. B. Tattle, and E. J. List.
Water Resources Research, Vol. 7, No. 6, p 1437-1447, December 1971. 5 tab, 9 ref, 1 append.

Descriptors: *Mathematical models, *Operations research, *Stochastic processes, *Dams, *Hydroelectric plants, *Hydroelectric power, *Linear programming, Flow, Basins, Energy, Storage, Continuity equation.
Identifiers: Waitaki basin (New Zealand).

Severe fluctuations in flow can occur when several hydroelectric plants are on the same river. This study develops a technique to allocate energy demand among the plants so as to satisfy operating needs and at the same time keep the river flow as

smooth as possible downstream from a selected dam. Such a series of hydroelectric plants is similar in some ways to a production line (here the processed commodity is water). The necessary mathematical model is developed for a linear programming formulation of the general smoothing problem. The formulation includes constraints on output and storage for each plant and also satisfies continuity equations. The method is applied successfully to an existing three-dam system, the Waitaki basin development project. Results for a normal operating system, the success of the technique and the physical reality of the mathematical model are discussed. The appendix includes the solutions to the mathematical problems. (Campbell-Cornell)
W72-06982

SYSTEMS ANALYSIS IN WATER RESOURCES PLANNING.
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06A.
W72-06984

PHENOLOGY OF SALT DESERT PLANTS NEAR CONTOUR FURROWS,
Utah State Univ., Logan. Dept. of Range Science.
N. E. West.
Journal of Range Management, Vol. 24, No. 4, p 299-304, July 1971. 9 ref, 4 tab.

Descriptors: *Phenology, *Xerophytes, *Furrows, *Plant growth regulators, *Crop production, Soil characteristics, Utah, Precipitation (Atmospheric), Evaporation, Vegetation effects, Limiting factors, Control structures, Seasonal, Seeds, Vegetation establishment, Arid lands, Erosion control, Soil-water-plant relationships.
Identifiers: *Salt deserts, Grand River Valley, Galleta, Shadscale, Nuttall saltbush, Mat saltbush, Atriplex.

Contour furrows retain runoff water to induce plant establishment, depending on soil characteristics. This study investigates if plants, established at time of contour construction, benefited by water retention. The salt desert study area is in the Grand River Valley, Utah. Precipitation, evaporation and soil-vegetation data were collected. Phenology of galleta, shadscale, nuttall saltbush and mat saltbush was investigated. Plants within one meter of the furrows were larger than control plants at least three meters from the treatments, four years following treatment. Phenological index scores indicated earlier spring growth for the Atriplex species, and longer summer and fall growth period for all species near furrows. Seed yields were greater for furrow plants. Such plants provide a sustained seed source for natural establishment when artificial seedings fail in arid lands. Erosion-control structures provide a favorable environment for seed production. (Popkin-Arizona)
W72-07037

INTEGRATED DEVELOPMENT OF THE ORANGE-VAAL AND TUGELA BASINS,
Rand Water Board, Johannesburg (South Africa).
For primary bibliographic entry see Field 06D.
W72-07042

STORM FLOW FROM DUAL-USE WATERSHEDS IN SOUTHWESTERN WISCONSIN,
Forest Service (USDA), La Crosse, Wis. North Central Forest Experiment Station.
R. S. Sartz.
USDA Forest Serv. Res. Pap. NC-69, 1971, 7 p., 6 fig, 1 tab, 8 ref.

Descriptors: *Storm runoff, *Sediment yield, *Agricultural watersheds, *Land use, Hydrographs, Upstream.
Identifiers: *Experimental watersheds, Peak flows, Terrain effects.

Some quantitative comparisons are presented of storm flow from upland fields and outflow at the bottom of the wooded slopes below. Most upland flows never reached the bottom of the forested slopes. In general, larger upland flows produced larger lower station flows, but there were many exceptions. Mean proportions of lower station to upland runoff for large storms ranged from 56 to 94 percent. Sediment content was higher at lower than at upper stations. The effectiveness of the forest zone in disposing of upland runoff appeared to be related to the ratio of forest to upland area.
W72-07073

FORESTS ALONG SMALL STREAMS AND FEATURES OF THEIR BOGGING,
V. G. Rubtsov, and A. A. Sokolov.
Lesovedenie. 4. 26-31. 1969. (Engl. summ.).
Identifiers: Bogging, Drainage, Forests, Hydrography, Small, Streams, USSR.

A brief silvicultural taxation characterization is given of forests along small streams in the northwest of the European USSR. These forests are situated in the paths of ground-water runoff and are closely connected with forest hydrography; they maintain the normal hydrological regime in the forest area. The draining of such forests is discussed. --Copyright Biological Abstracts, Inc.
W72-07075

ECONOMETRIC MODEL FOR RIVER BASIN PLANNING,
M. Boerlin.
Organisation for Economic Co-operation and Development, Paris, France. 1971. 94 p, 5 fig, 9 tab, 81 ref, 2 append.

Descriptors: *River basin development, *Simulation analysis, *Econometrics, Project planning, Cost-benefit analysis, Mathematical models, Statistical models.

The results obtained from an attempt to build an econometric simulation model for studying river basin development planning are presented. This simulation model allows the effects of different river basin development projects on certain target variables to be studied. The target variables considered are total population, employment rate, income per head, and the number of family farms. As it has been developed, the simulation model is modular; that is, it is built up from a variety of sectors or modules. These submodels are concerned with the agricultural and processing sector, the demographic sector, the employment sector, the income sector, and the water sector. Besides simulating the effects of alternative river basin development schemes, this model might be useful for simulating alternative targets or choice indicators; this simulation should be done whenever there is no full consensus on the criteria which have to be considered. Also, a simulation of alternative sets of data may prove useful for dealing with the uncertainty surrounding such data. Some consideration is given to model validation, the choice problem in a single-target situation, and the choice problem in a multi-target situation. (Settle-Wisconsin)
W72-07110

COMPETITION FOR WETLANDS IN THE MIDWEST. AN ECONOMIC ANALYSIS,
Social Security Administration, Baltimore, Md. Office of Research and Statistics.
J. H. Goldstein.
Resources for the Future, Inc., The Johns Hopkins Press, Baltimore, Maryland. 1971. 105 p, 10 tab, 3 append. Price $3.50.

Descriptors: *Wetlands, *Wildlife habitats, *Agriculture, *Central U.S., Economic efficiency, Drainage, Minnesota.
Identifiers: *Allocative efficiency, *Midwest.

The allocation of wetlands between the agriculture and wildlife sectors has the classic characteristics of a resource distribution problem--one scarce resource exists with two alternative uses. Consequently, two central questions are considered: (1) how severe is the misallocations of resources between the agriculture and wildlife secors under current market conditons, and (2) if there were freely competitive prices in the farm sector and no subsidies to cover the cost of drainage, would more wetlands be converted into agricultural land than is socially desirable. These questions are approached within the framework of the following decision rule: if the discounted value of the net social benefits from the drained land less the cost of drainage exceeds the discounted value of the net social benefits from the land as marsh land, then the appropriate use for the land is agricultural. The results of the study suggest that the investment costo of draining permanent wetlands is sufficiently high to prevent reclamation if perfectly competitive farm prices prevail and marsh owners pay the full cost of drainage. However, if current price supports prevail, hunting fees may not forestall drainage in certain areas. Also, reclamation may have significant impacts on the quality of hunting. (Settle-Wisconsin)
W72-07111

RELATION OF STAND PRODUCTIVITY TO GROUNDWATER LEVEL IN THE KIROV REGION, (IN RUSSIAN),
A. F. Timofeev.
Lesovedenie. 4. 9-17. 1969. (Engl. summ.).
Identifiers: Birch-D, Drainage, Forest, Ground, Kirov, Pine-G, Productivity, Relation, Soil, Spruce-G, Stand, USSR.

The dependence of the growth season and annual average values of the groundwater level on the amount of rainfall during that period is expressed by a parabolic equation. The values of coefficients of this equation are determined for various types of pine and spruce forests. Equations expressing the relationship between the productivity of pine, spruce, and birch stands and the groundwater level are given. Recommendations for forest land draining norms are given differentially according to tree species, soils and season.--Copyright 1971, Biological Abstracts, Inc.
W72-07114

WATER CONSERVATION SIGNIFICANCE OF FOREST STANDS UNDER THE CONDITIONS OF TIEN SHAN, (IN RUSSIAN),
For primary bibliographic entry see Field 03B.
W72-07116

OPTIMAL SYSTEMS DESIGNING FOR EFFICIENCY IN KASHMIR'S RENEWABLE RESOURCE USE,
Sardar Patel Univ., Vallabh Vidyanagar (India).
For primary bibliographic entry see Field 06A.
W72-07118

DUCK CREEK CHANNEL IMPROVEMENT--GARLAND, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.

Available from the National Technical Information Service as PB-198 911-F, $3.00 in paper copy, $0.95 in microfiche. April 2, 1971. 29 p, 14 append.

Descriptors: *Channel improvement, *Flood control, *Flood protection, *Environmental effects, Rivers and Harbors Act, Flood plains, Project planning, Flood plain insurance, Recreation, Governmental interrelations, Administrative agencies, Levees, Flood proofing, Flood plain zoning, Reservoirs, Texas.
Identifiers: *Duck Creek (Tex.), National Environmental Policy Act, *Environmental impact statements.

The Duck Creek Channel improvement proposal is a flood control project consisting principally of channel realignment and enlargement. The project will also help provide a cleaner, safer stream through intensely urbanized areas. The only adverse environmental effects will be the loss of a few large shade trees and the reshaping of several small areas of natural rock outcroppings. Proposed beautification measures will provide for a higher quality environment than exists now. Alternatives include a flood control reservoir, flood proofing, flood plain zoning, and the adoption of flood plain regulations. These would be relatively ineffective. The Bureau of Outdoor Recreation disagreed with some of the statement's conclusions. The project's assets should be considered adverse effects, according to the Bureau. Furthermore, the Bureau asserted that flood plain management has not been adequately considered as an alternative. The viewpoints of other agencies are included. (Brackins-Florida)
W72-07177

KLUTINA RIVER FLOOD CONTROL, COPPER CENTER, ALASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 08D.
W72-07178

MARTINS FORK LAKE, CUMBERLAND RIVER BASIN, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Nashville, Tenn.
For primary bibliographic entry see Field 08A.
W72-07180

A PRELIMINARY ECOLOGICAL STUDY OF AREAS TO BE IMPOUNDED IN THE SALT RIVER BASIN OF KENTUCKY,
Kentucky Water Resources Inst., Lexington.
L. A. Krumholz, and S. E. Neff.
Available from the National Technical Information Service as PB-208 413, $3.00 in paper copy, $0.95 in microfiche. Kentucky University Water Resources Institute Research, Lexington, Report No 48, 1972. 25 p, 2 fig, 2 tab, 12 ref. OWRR B-016-KY (1).

Descriptors: *Water quality, *Rivers, *Pre-impoundment, *Kentucky, *Ecology, Hydrologic data, Data collections, Chemical analysis, Aquatic life, Fish, Aquatic microorganisms, Wildlife, Birds, Streamflow, Flow characteristics, Watershed management.
Identifiers: *Salt River basin (Ky), *Pre-impoundment studies.

Physical, chemical, and biological characteristics were studied at 38 sites on the main stem of the Salt River (Kentucky) upstream from the proposed damsite for Taylorsville Lake, an impoundment of about 3,6000 acres. Values for dissolved oxygen ranged from 60% to 120% of saturation, turbidities from 5 to 650 mg/liter as SiO2, total alkalinities from 130 to 220 mg/liter as CaCO3, pH from 6.8 to 8.4, and total dissolved solids from 40 to 160 mg/liter. Conductivity ranged from 100 to 350 micromhos, nitrate nitrogen from 0.1 to 9.9 mg/liter, and orthophosphate from 0.2 to 2.9 mg/liter. Iron and manganese were consistently present in low quantities. Estimates of standing crop of bottom organisms ranged from 0 on the bare limestone bottom to more than 275 pounds per acre in more suitable areas. The profusion and species diversity of bottom organisms indicate a healthy stream. More than 50 species of fishes have been collected and more than 100 species of birds have been identified in the area. (Woodard-USGS)
W72-07224

HYDROLOGICAL FORECASTING.
For primary bibliographic entry see Field 02A.
W72-07233

FORECASTING WATER-LEVELS OF THE ORINOCO RIVER IN VENEZUELA,
For primary bibliographic entry see Field 02A.
W72-07240

APPLICATIONS OF DISCHARGE AND WATER-LEVEL FORECASTS,
Comite National Francaise de Geodesie et Geophysique, Rueil-Malmaison. Section d'-Hydrologie Scientifique.
For primary bibliographic entry see Field 02A.
W72-07241

FLOOD WARNINGS--THE ROLE OF THE NEW SOUTH WALES CIVIL DEFENCE ORGANISATION,
Civil Defence Organization, Sydney (Australia).
For primary bibliographic entry see Field 02A.
W72-07242

THE OPERATION OF SOMERSET DAM--A MULTI-PURPOSE PROJECT (AUSTRALIA),
Water Supply Design Office, Brisbane (Australia).
For primary bibliographic entry see Field 02A.
W72-07243

THE COMPUTATION AND FORECASTING OF MAXIMUM FLOOD DISCHARGES,
For primary bibliographic entry see Field 02A.
W72-07245

4B. Groundwater Management

AGRICULTURE'S EFFECT ON NITRATE POLLUTION OF GROUNDWATER,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 05B.
W72-06598

INTERSTATE GROUND-WATER AQUIFERS OF THE STATE OF WASHINGTON (PHYSICAL AND LEGAL PROBLEMS--A PRELIMINARY ASSESSMENT),
Washington State Water Research Center, Pullman.
Allen F. Agnew, and Russell W. Busch.
Available from the National Technical Information Service as PB-208 026, $3.00 in paper copy, $0.95 in microfiche. Report No. 8, September 1971. 170 p, 12 fig, 1 tab, 99 ref. OWRR A-038-WASH (1).

Descriptors: *Aquifers, *Groundwater basins, Hydrogeology, *Legal aspects, International waters, Interstate, *Washington, Oregon, Idaho, *Water law, Water demand, Water utilization, Water rights.
Identifiers: British Columbia.

The State of Washington possesses ground-water resources that are huge in some areas, adequate in others, and small in a few. But the adequacy of such a resource is governed by several factors--the physical characteristics of its occurrence and replenishment, the demands for various uses, and the legal framework within which those demands can be realized. Ground-water reservoirs, like surface-water streams and lakes, do not stop at the state line, so many of the ground-water basins of Washington are shared with Oregon, Idaho, and the Province of British Columbia. One of the limiting factors in the use of such a resource is the lack of uniformity of laws and rights affecting ground water between states and between a state and a province of different nations. Part A of the study, in dealing with the physical situation, examined eleven such shared ground-water areas around the borders of Washington. Important problems exist in three (Walla Walla, Pullman-Moscow, and Spokane-Rathdrum Prairie), no foreseeable problems exist in two (Vancouver, Washington and Longview), and the remaining six have varying degrees of problems with possibility of their becoming more critical if patterns of water use change significantly (Clarkston-Lewiston, Pend Oreille, Kettle, Okanogan, Nooksack-Sumas, and The Dalles). Studies are recommended in two of the three areas with important problems and in five of the six which have varying degrees of problems. Part B discusses legal aspects of interstate and international ground-water management and administration with respect to supplies shared by Washington and other states and British Columbia.
W72-06608

MAPS OF THE WATERSHEDS OF THE SANTA MARGARITA AND SAN LUIS REY RIVERS, RIVERSIDE AND SAN DIEGO COUNTIES, CALIFORNIA SHOWING GROUND-WATER QUALITY DATA, 1971,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-06770

GEOHYDROLOGY OF PROJECT GNOME SITE, EDDY COUNTY, NEW MEXICO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08H.
W72-06784

HYDROGEOLOGIC DATA FOR THE UPPER CONNECTICUT RIVER BASIN, CONNECTICUT,
Geological Survey, Hartford, Conn.
R. B. Ryder, and L. A. Weiss.
Available from State Dept. of Environmental Protection, State Office Bldg., Hartford, Conn. Connecticut Water Resources Bulletin No 25, 1971. 54 p, 1 fig, 1 plate, 7 tab, 8 ref.

Descriptors: *Hydrologic data, *Data collections, *Groundwater, *Water quality, *Connecticut, Streams, Observation wells, Water wells, Aquifers, Logging (Recording), Water levels, Water yield, Drawdown, Pumping, Water users, Chemical analysis, Hydrogeology, Groundwater basins, Watersheds (Basins).
Identifiers: *Connecticut River Basin (Conn), Basic data.

Geologic, groundwater, and quality-of-water data are compiled from a water resources investigation of the upper Connecticut River basin which includes a 508-square-mile area in north-central Connecticut drained by the Connecticut River and its tributaries. The basin includes all or parts of the following 30 towns: Avon, Bloomfield, Bolton, Cromwell, East Granby, East Hampton, East Hartford, East Windsor, Ellington, Enfield, Farmington, Glastonbury, Hartford, Manchester, New Britain, Newington, Plainville, Portland, Rocky Hill, Simsbury, Somers, South Windsor, Stafford, Suffield, Tolland, Vernon, West Hartford, Wethersfield, Windsor, and Windsor Locks. The data for this study were collected during the period July 1967 - December 1969. However, many records of wells and test holes in this report were collected during previous investigations and are included as a convenient reference. (Woodard-USGS)
W72-06792

WATER RECORDS OF PUERTO RICO, 1964-67: VOLUME 2--SOUTH AND WEST SLOPES,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 07C.
W72-06798

THERMAL WATERS OF FOLD AND PLATFORM REGIONS OF THE USSR (TERMAL'-NYYE VODY SKLADCHATYKH I PLATFORMENNYKH OBLASTEY SSSR),
All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).
For primary bibliographic entry see Field 02K.
W72-06804

GASOLINE IN GROUNDWATER,
California Inst. of Tech., Pasadena. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05B.
W72-06810

DEEP WELLS FOR INDUSTRIAL WASTE INJECTION IN THE UNITED STATES--SUMMARY OF DATA,
Federal Water Pollution Control Administration, Cincinnati, Ohio.
For primary bibliographic entry see Field 05E.
W72-06907

WATER BALANCE STUDY OF THE GROUND WATER ON THE LOWER PART OF THE RIVER FUJI,
Tokyo Univ. of Education (Japan). Geographical Inst.; and Tokyo Univ. of Education (Japan). Geological and Mineralogical Inst.
For primary bibliographic entry see Field 02F.
W72-06909

SELECTED DIGITAL COMPUTER TECHNIQUES FOR GROUNDWATER RESOURCE EVALUATION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 02F.
W72-06914

APPLICATION OF OPERATIONS RESEARCH TECHNIQUES FOR ALLOCATION OF WATER RESOURCES IN UTAH,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 06A.
W72-06972

HYDROGEOLOGY OF A PLAYA NEAR AMARILLO, TEXAS,
Southwestern Great Plains Research Center, Bushland, Tex.
F. B. Lotspeich, O. R. Lehman, V. L. Hauser, and B. A. Stewart.
USDA Agricultural Research Service Southwestern Great Plains Research Center Technical Report No 10, September 1971. 35 p, 14 fig, 1 tab, 32 ref.

Descriptors: *Playas, *Hydrogeology, *Groundwater recharge, *Wells, Southwest U.S., Irrigation water, Aquifer characteristics, Specific yield, Lake basins, Artificial recharge, Water management (Applied), Specific retention, Permeability, Crop production, Economics.
Identifiers: *Southern High Plains, *Ogallala aquifer, Amarillo (Tex).

The objectives are to describe the sediments underlying the playa and its watershed, and to relate these findings to recharge potentials of playa water over a large part of the Southern High Plains. The modern, progressive economy of this semiarid region depends on groundwater; high yields of cereal grains, cotton, and other crops depend on irrigation, and most public and local domestic water supplies come from wells. The available supply is being essentially 'ruined' because more water is being withdrawn than replenished. An estimated 2.5 to 3 million acre-ft of water collects annually in thousands of playas in the region, most of which is lost to evaporation. Research is underway on methods of recharging the High Plains aquifer with these waters. Descriptions, graphs, and other drawings show much of the information obtained from borings and other field tests. Physical data show the aquifer sands to be dominantly less than 0.5 mm in size, well sorted, and low in permeability. Specific yield is higher than suggested in earlier reports, and is an indication of ready yield of interstitial water. Sand texture indicates that moderate recharge rates will occur through injection wells. (Lang-USGS)
W72-07004

MATHEMATICAL GROUND-WATER MODEL OF INDIAN WELLS VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 02F.
W72-07008

UNDERGROUND STORAGE OF IMPORTED WATER IN THE SAN GORGONIO PASS AREA, SOUTHERN CALIFORNIA,
Geological Survey, Washington, D.C.
R. M. Bloyd, Jr.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Geological Survey Water-Supply Paper 1999-D, 1971. 37 p, 8 fig, 2 plate, 7 tab, 21 ref.

Descriptors: *Artificial recharge, *Hydrogeology, *California, Aquifer characteristics, Hydrologic data, Hydrologic budget, Water balance, Data collections, Groundwater movement.
Identifiers: San Gorgonio Pass (Cal).

Water resources in the San Gorgonio Pass area of California are probably overdeveloped. A cooperative study was made to investigate the technical feasibility of underground storage of imported water in the agency area. It is technically feasible to store imported water without causing waterlogging and without losing any significant quantity of stored water. Water imported at an average rate equal to the anticipated rate of annual demand (17,000 acre-feet) can probably be recharged into part of the storage unit without raising the water level in sec. 33, for at least 20 years. Under existing hydrologic and geologic conditions, injected water probably can remain in the Beaumont storage unit until it is needed. Average annual precipitation is 332,000 acre-feet. Average annual water loss by evapotranspiration is 308,000 acre-feet. Average annual surface outflow is 1,700 acre-feet. Average annual groundwater recharge is 22,000 acre-feet. Annual subsurface outflow from the agency area in 1967 was 6,000 acre-feet into the Redlands area, 800 acre-feet into the fault systems south of the Banning storage unit, and 220 acre-feet into Potrero Canyon. Subsurface outflow into Coachella Valley in 1967 was probably less than 50 percent of the steady-state flow. (Knapp-USGS)
W72-07023

ANNUAL REPORT ON GROUND WATER IN ARIZONA, SPRING 1970 TO SPRING 1971.
Geological Survey, Phoenix, Ariz.

Available from Ariz. Water Comm., 34 W. Monroe St., Suite 707, Phoenix, Ariz. 85003. Arizona Water Commission Bulletin 1, January 1972. 45 p, 30 fig, 1 tab.

Descriptors: *Groundwater, *Hydrogeology, *Water wells, *Hydrologic data, *Arizona, Data collections, Water yield, Water level fluctuations, Pumping, Water users, Water supply, Water resources development, Water demand, Irrigation, Domestic water, Stock water, Geology.

The groundwater reservoirs are the source of nearly two-thirds of Arizona's water supply. Although municipal and industrial water uses are increasing, the greatest use is still for irrigation. For the last 18 years, the withdrawal of groundwater has been more than 4 million acre-feet per year, and in 1970 nearly 4.9 million acre-feet of water was withdrawn. A table shows the amount of water pumped in each of the major developed areas in 1970 and the accumulated total since the beginning of record. Through 1970, nearly 134 million acre-feet of groundwater has been withdrawn in the State. Graphs show water levels in selected wells and estimated annual groundwater pumpage (1945-71) in most of the developed areas in Arizona. Maps show (1) potential well production, (2) depth to water in selected wells in spring 1971, and (3) change in water levels in selected wells from 1966 to 1971 by areas. (Woodard-USGS)
W72-07027

RELATION OF STAND PRODUCTIVITY TO GROUNDWATER LEVEL IN THE KIROV REGION, (IN RUSSIAN),
For primary bibliographic entry see Field 04A.
W72-07114

INVESTIGATIONS CONCERNING PROBABLE IMPACT OF NITRILOTRIACETIC ACID ON GROUND WATER,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05B.
W72-07223

STUDIES ON THE QUALITY OF UNDERGROUND WATERS OF BHILWARA AND CHITTORGARH DISTRICTS OF RAJASTHAN, (IN JAPANESE),
Rajasthan Univ., Jaipur (India). Dept. of Agriculture.
For primary bibliographic entry see Field 03C.
W72-07270

4C. Effects on Water of Man's Non-Water Activities

METHODS OF ANALYSIS AND DETERMINATION OF EFFECTS OF ALTERNATIVE USES OF FORESTED LAND ON STREAMFLOW,
Washington Univ., Seattle. Coll. of Forest Resources.
David D. Wooldridge.
Available from the National Technical Information Service as PB-208 025, $3.00 in paper copy, $0.95 in microfiche. Completion Report. (1971). 60 p, 32 fig, 16 tab. OWRR A-022Wash (1).

Descriptors: *Regression analysis, *Watershed management, Surface runoff, Water yield, Cutting management, *Washington, *Streamflow forecasting, Streamflow, Forests, *River basins, Data collections, *Forest management, Vegetation effects, Climatic data, *Alternative water use.

Principal component analysis utilizing varimax rotation of components was used to develop daily streamflow prediction equations using existing streamflow and precipitation records. Analyses were primarily confined to river basins receiving maximum amounts of total precipitation as rainfall. A few analyses used rivers with large winter snow pack accumulations. Reduced accuracy of prediction equations was found when snowmelt is the main source of streamflow. Interpretation of the variation in prediction equations over time confirmed the theoretical considerations that forest land management does influence the hydrologic regime of river basins. Increased water yields were demonstrated when significant portions of the watershed were logged. Decreases in water yields were also demonstrated as second growth forests reestablish and stabilize the hydrologic regime.
W72-06606

RELEASE OF MERCURY FROM CONTAMINATED FRESHWATER SEDIMENTS BY THE RUNOFF OF ROAD DEICING SALT,
JBF Scientific Corp., Burlington, Mass.
For primary bibliographic entry see Field 05B.
W72-06911

HYDROLOGY OF TWO SMALL RIVER BASINS IN PENNSYLVANIA BEFORE URBANIZATION,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W72-06912

INTERRELATIONSHIPS OF VEGETATION AND ENVIRONMENTAL FACTORS ON A MOUNTAIN WATERSHED IN SOUTHEASTERN WYOMING,
Wyoming Univ., Laramie. Div. of Plant Science.
For primary bibliographic entry see Field 04D.
W72-07040

THE IMPACT OF ECONOMIC ACTIVITY ON CLIMATE,
For primary bibliographic entry see Field 02B.
W72-07046

PRINCIPAL MASS MOVEMENT PROCESSES INFLUENCED BY LOGGING, ROAD BUILDING, AND FIRE.
Forest Service (USDA), Juneau, Alaska. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 04D.
W72-07070

4D. Watershed Protection

SOIL EROSION BY WATER ON UPLAND AREAS,
Agricultural Research Service, Lafayette, Ind.
For primary bibliographic entry see Field 02J.
W72-06763

INTERRELATIONSHIPS OF VEGETATION AND ENVIRONMENTAL FACTORS ON A MOUNTAIN WATERSHED IN SOUTHEASTERN WYOMING,
Wyoming Univ., Laramie. Div. of Plant Science.
P. W. Jacoby, Jr.
Ph.D. Dissertation, May 1971. 127 p, 11 tab, 51 ref, 15 fig. Project No. OWRR A-001-WYO (46).

Descriptors: *Vegetation effects, *Environmental effects, *Mountains, *Watersheds (Basins), *Soil-water-plant relationships, Wyoming, Altitude, Soil texture, Erosion, Alkali soils, Leaching, Soil moisture, Trees, Plant groupings, Plant populations, Burning, Dendrochronology, Growth rates.
Identifiers: Plant succession.

Interrelationships between environment and vegetation on a forested mountain watershed were investigated by collection of data along an altitudinal gradient from 8,400 to 10,600 feet in elevation. High soils were coarser and more alkaline, indicating influences of erosion, parent material, and leaching. Soil-moisture-holding capacity was greatest in higher soils. Forest showed compositional change from lodgepole pine to subalpine fir and to Engelmann spruce with increasing elevation. Tree growth-rings indicate several times of fire in the watershed. Coniferous forest is in a state of secondary plant succession following fire and logging effects. The Wyoming watershed studied is typical of forests described in earlier literature. (Popkin-Arizona)
W72-07040

PRINCIPAL MASS MOVEMENT PROCESSES INFLUENCED BY LOGGING, ROAD BUILDING, AND FIRE.
Forest Service (USDA), Juneau, Alaska. Pacific Northwest Forest and Range Experiment Station.
D. N. Swanston.
In: Forest Land Uses and Stream Environment, Proceedings of a Symposium, October 19-21, 1970, Oregon State University, August 1971, p. 29-39. 6 fig, 13 ref.

Descriptors: *Mass wasting, *Slopes, *Road construction, *Lumbering, *Burning, Debris avalanches, Creep, Soil stabilization, Pacific Coast region, Mountains.
Identifiers: *Western United States, *Angle of stability, Channel obstruction.

Dominant natural soil mass movement processes active on watersheds of the Western United States include (1) debris avalanches, debris flows and debris torrents; (2) slumps and earth flows; (3) deep-seated soil creep; and (4) dry creep and sliding. A dominant characteristic of each is steep slope occurrence, frequently in excess of the angle of stability of the soil. All but dry creep and sliding occur under high soil moisture conditions and usually develop or are accelerated during periods of abnormally high rainfall. Further, all are encouraged or accelerated by destruction of nautral mechanical support on the slopes. Logging, road building, and fire play an important part in initiation and acceleration of these soil mass movements. Road building stands out at the present time as the most damaging activity, with soil failures resulting largely from slope loading, backslope cutting, and inadequate slope drainage. Logging and fire affect stability primarily through destruction of natural mechanical support for the soils, removal of surface cover, and obstruction of main drainage channels by debris.
W72-07070

EFFECTS OF PRESCRIBED FIRE ON VEGETATION AND SEDIMENT IN OAK-MOUNTAIN MAHOGANY CHAPARRAL,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
C. P. Pase, and A. W. Lindenmuth, Jr.
Journal of Forestry, Vol. 69, No. 11, p. 800-805, November 1971. 4 fig, 6 tab, 11 ref.

Descriptors: *Burning, *Chaparral, *Vegetation regrowth, *Sediment yield, Slope protection, Erosion control, Forest management, Wildlife management, Canopy, Germination, Accelerated erosion, Herbicides, Arizona.

Approximately 25 percent of each of three small watersheds was treated in strips of 50, 100 or 200 feet width in each of four years. A fourth watershed was not treated. Treatment consisted of late summer spraying with a commercial mixture of 2,4-D and 2,4,5-T, and prescribed fire in late September or October. Shrub crown cover was reduced an average of 94 percent. Strip width did not significantly affect shrub topkill. Most shrubs resprouted and quickly reestablished control over the site. Seedlings of desert ceanothus and manzanita were abundant. Herbaceous cover, low before the treatment, increased greatly in the early post-fire years. Grasses were uncommon both before and after treatment. Litter mass averaged 6.4 tons per acre before treatment; 66 percent remained after the prescribed fire. Total 5-year sediment loss was 695 tons, or approximately 0.30 acre-foot, per square mile per year. Results show good but very temporary control of oak-mountain-mahogany chaparral with carefully prescribed fire. The technique appears less damaging to the site than the less carefully controlled broadcast fire or wildfire.
W72-07074

SUITABILITY OF CEANOTHUS PROSTRATUS BENTH. FOR THE REVEGETATION OF HARSH SITES,
Forest Service (USDA), Logan, Utah. Intermountain Forest and Range Experiment Station.
R. W. Brown, R. H. Ruf, and E. E. Farmer.
USDA Forest Serv Res Note INT-144, August 1971. 12 p, 4 fig, 2 tab, 8 ref.

Descriptors: *Nitrogen fixation, *Vegetation regrowth, *Environmental effects, *Slope stability, *Soil stability, *Revegetation, *Erosion control, Fertility, Moisture stress, Plant growth, Root systems, Utah, Idaho.
Identifiers: Granitic soils, Harsh sites, Plant competition, Plant propagation, Stem cuttings.

Rooted stem cuttings of squaw carpet (Ceanothus prostratus Benth.) were planted on a number of natural and man-made harsh sites from southern Utah to central Idaho. Percent survival and growth data indicate that this species supports considerable genetic variation among individual plants. Also, squaw carpet is not capable to competing with native vegetation, and is, therefore, best suited as a pioneer plant on particularly severe harsh sites, free of competing vegetation. It is recommended that squaw carpet be planted in well aerated and drained soils, preferably of a granitic origin. This species is capable of supporting nitrogen-fixing micro-organisms in root nodules, and thus can be expected to improve the mineral nutritional qualities of harsh sites with time. This is substantiated by the fact that mulching and fertilizing treatments did not improve survival or growth of squaw carpet.
W72-07080

GEOLOGIC SOIL GROUPINGS FOR THE PINYON-JUNIPER TYPE ON NATIONAL FORESTS IN NEW MEXICO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
E. F. Aldon, and H. G. Brown, III.
USDA Forest Serv. Res. Note RM-197, 1971. 4 p, 1 fig, 2 tab.

Descriptors: *Geology, *Watershed management, *Soil classification, Erosion, Soils, New Mexico.
Identifiers: *Pinyon-Juniper type.

Almost 29 percent of the pinyon-juniper woodland type is on highly unstable geologic formations that contribute to high sediment yields. Sedimentary units make up 54 percent of the acreage in the type, igneous units 39 percent, and Pre-Cambrian formations 7 percent.
W72-07081

MANAGEMENT OF FRENCH PETE CREEK, WILLAMETTE NATIONAL FOREST, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Forest Service (USDA), Washington, D. C.

Available from the National Technical Information Service as PB-200 954-F, $3.00 in paper copy, $0.95 in microfiche. July 16, 1971. 23 p, 5 disc.

Descriptors: *Environmental effects, *National forests, *Oregon, *Forest management, *Watershed management, Lumbering, Access routes, Erosion, Sedimentation, Wildlife habitats, Cutting management, Water quality, Camp sites, Landscaping, Recreation, Recreation wastes, Reforestation, Resources development, Resource allocation, Federal government.
Identifiers: *Environmental impact statements.

French Pete Drainage Basin encompasses 19,000 acres on the west slope of the Oregon Cascades. Under the proposed project, the lower canyon area would be left in its existing state pending further study, upper canyon areas will be left to timber and administrative usage, campground use will be limited, better landscape practices will be followed, and a trail will be constructed around the botanical area. Limited timber use may be made with minimal road construction, so as to preserve the area's watershed quality and minimize erosion, fire risk, wildlife impact, and scenic destruction. Waste disposal facilities will be necessary at recreation sites. Restrictions will be placed on motor vehicle use. Public notice will be given and intensive examination made prior to any timber sale. Alternative uses are to permit walk-in use only, to develop the area to serve a maximum number of people, to manage the area as part of the wilderness preservation system, to allow maximum timber use, and to allow back country recreation without roads. The relationship between short-term uses and maintenance and enhancement of long-term productivity is assessed. Criticism of the plan by interested federal and state agencies is presented. (Grant-Florida)
W72-07179

EFFICIENCY OF CERTAIN EROSION-CONTROL PRACTICES DURING PRIMARY TILLAGE IN THE ROSTOV REGION, (IN RUSSIAN),
F. A. Mironchenko, and A. T. Kolpakov.
Sb Nauchn Tr Donsk S-Kh Inst. 4 (3): 28-35. 1968.
Identifiers: Control, Erosion, Fall, Furrowing, Plowing, Primary, Ridging, Rostov, Tillage, USSR.

The system of primary fall plowing must be supplemented with ridging and furrowing for fields lying on slopes with gradients exceeding 2-3 degrees. Closer arangement of the ridges yields better results on slopes with a marked relief. These practices diminish erosion, facilitate retention of snow and surface runoff, and improve crop yields.--Copyright 1972, Biological Abstracts, Inc.
W72-07274

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

DETECTION AND IDENTIFICATION OF MOLECULAR WATER POLLUTANTS BY LASER RAMAN SPECTROSCOPY,
Kentucky Water Resources Inst., Lexington.
Eugene B. Bradley, Charles A. Frenzel, John Reeves, Robert McConnell, and Kay Lane.
Available from the National Technical Information Service as PB-208 029, $3.00 in paper copy, $0.95 in microfiche. Research Report No. 44, October 1971, 41 p, 14 fig, 3 tab, 13 ref. OWRR A-015-KY (1).

Descriptors: *Pollutant identification, Measurement, *Spectrometers, *Spectroscopy, *Instrumentation, *Analytical techniques.
Identifiers: *Laser raman spectroscopy, *Carbon disulfide, *Benzene.

Laser Raman spectroscopy is evolving into a primary tool for the identification of molecular water pollutants. This study approaches the limits of detectivity of carbon disulfide and benzene to difference 20 ppm in water solutions using a high-resolution Raman spectrometer, cooled detectors, and photon counting techniques. The primary limiting factors were the low throughput and the scattered light performance of the monochromator as well as insufficient laser energy. An optomized design for a pollution-measuring instrument is suggested, and a prototype has been built which is useful with any value of excitation energy short of sample degrading. The present instrument scans spectrum windows with fixed preselecting filters followed by a small single monochromator with high throughput. No detector cooling or refinements in signal processing were attempted. The resulting detectivity with 20 mw of laser power was only 1000 ppm. However, the scattered light background or 'optical noise' is unmeasurable except at the laser frequency, where it was a maximum of six percent of full scale measured against the 992 cm-1 Raman band of benzene. Equipped with an ion laser a practical field instrument capable of detectivity of 1 ppm will cost about $20,000. The instrument described herein can be built for $4,000, less laser.
W72-06611

COMPARISON OF SAMPLING METHODS FOR THE ISOLATION OF SALMONELLA FROM MODERATELY POLLUTED WATERS,
Department of National Health and Welfare, Kingston (Ontario). Div. of Public Health Engineering.
B. J. Dutka, P. G. Collins, J. B. Bell, and J. M. Vanderpost.
Manuscript Report No. Kr 70-1. 1970, 46 p, 3 fig, 21 refs.

Descriptors: *Salmonella, *Water quality, *Water analysis, *Sampling, Water sampling.
Identifiers: *Cataragui River.

Qualitative sampling techniques for the demonstration of Salmonellae in receiving waters were compared. The collecting pad and 50-gallon field filtered samples were found to be equally efficient in isolating Salmonellae from waters containing low to moderate numbers of coliforms. The efficiency of the collecting pads did not increase with prolonged exposure (3 to 5 days). The use of the 50-gallon on site filtering technique for Salmonella isolation in routine stream surveys is recommended. The efficiencies of several enrichment broth-selective agar combinations in resuscitating and isolating Salmonellae were compared and Tetrathionate Broth-Brilliant Green Agar was the most productive combination during this study. In different geographical locations, because of specific water conditions, other media combinations may be more productive and therefore, various broth-agar combinations should be evaluated, whenever a new geographical area is being studied. (CCIW)
W72-06687

SELF-ABSORPTION CORRECTIONS FOR THE 14C METHOD WITH BACO3 FOR MEASUREMENT OF PRIMARY PRODUCTIVITY,
State Univ. Coll., Fredonia, N.Y. Dept. of Biology.
Kenneth G. Wood.
Ecology. 52 (3): 491-498. 1971. Illus.
Identifiers: Absorption, Barium, Carbon-14, Carbonate, Corrections, Measurement, Method, Primary, Productivity.

Self-absorption of 14C beta radiation follows an exponential relationship under certain conditions. A new method of BaCO3 fixation of activity is presented by which it is possible to determine primary productivity without using the efficiency of the detector in the calculations. Many objections to the Geiger-Muller method are explained, and corrections are suggested for the methods of Steemann Nielsen and of Sorokin.--Copyright 1971, Biological Abstracts, Inc.
W72-06707

DETERMINATION OF THE BIODEGRADABILITY OF ANIONIC SYNTHETIC SURFACE AGENTS.
Organization for Economic Co-Operation and Development, Paris (France).

Riv Ital Sostanze Grasse. 48 (2): 51-60. 1971. Illus.
Identifiers: Anionic, Degradability, Determination, Surface, Synthetic.

The increased use of biodegradable washing detergents led to increased water pollution. To promote control of this situation, a testing procedure which measures the ability of commercial detergents to be degraded into soluble substances was developed and is described. A solution of the detergent is exposed to microorganisms for a given time period. The suspended or dissolved material is then solubilized in chloroform and any water insoluble salts are detected by the addition of methylene blue. A series of controls are used as comparisons, therefore the amount of coloration indicated the biodegradability of the detergent.--Copyright 1971, Biological Abstracts, Inc.
W72-06722

INSTRUMENTATION AND MEASURING TECHNIQUES,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 02J.
W72-06761

THE DETERMINATION OF THE PHOSPHORUS CONTENT OF DETERGENTS,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
P. D. Goulden, W. J. Traversy, and M. Comba.
Technical Bulletin No 45, 1971. 9 p, 1 fig, 1 ref, append.

Descriptors: *Chemical analysis, *Phosphates, *Detergents, *Pollutant identification, Water pollution control, Analytical techniques, Laboratory tests.
Identifiers: *Laundry detergent, *Canada.

The procedures used in the Water Quality Division laboratories, (Canada) to determine the phosphorus concentration of detergents are described. A manual method published by the American Society for Testing and Materials, modified to overcome the interference from borates, is used to analyze samples that have a phosphorus concentration close to the 20% P205 maximum specified in the Phosphorus Concentration Control Regulations. An automated method was developed, using Technicon AutoAnalyzer equipment, that enables detergent samples to be screened for phosphorus content at a rate of 20 samples per hour. (Woodard-USGS)
W72-06779

COMPUTER PROGRAMS IN USE IN THE WATER QUALITY DIVISION, VOL. 3,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 07C.
W72-06780

METHODS OF ANALYSIS OF NATURAL WATERS, (METODY ANALIZA PRIRODNYKH VOD),
For primary bibliographic entry see Field 02K.
W72-06801

ABSORPTION OF FERRIC IRON IN REDUCED SODA-SILICA GLASSES CONTAINING CHALCOGENIDES,
Acta Polytechnica Scandinavica, Stockholm (Sweden).
For primary bibliographic entry see Field 02K.
W72-06862

THE USE OF POLAROGRAPHY IN WATER POLLUTION CONTROL,
Cambridge Water Works (England).
For primary bibliographic entry see Field 05G.
W72-06867

TURBIDITY MEASUREMENT,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
For primary bibliographic entry see Field 02J.
W72-07000

ELECTROCHEMICAL POTENTIALS OF HIGH PURITY METALS IN SEA WATER,
Naval Research Lab., Key West, Fla. Marine Corrosion Research.
For primary bibliographic entry see Field 02K.
W72-07028

WATER RESOURCES DATA FOR TEXAS: PART 2. WATER QUALITY RECORDS, 1969.
Geological Survey, Austin, Tex.

Available from Dist Chief, USGS, 300 E. 8th St., Austin, Tex 78701. Geological Survey Basic Data Report, 1972. 642 p, 3 tab, 19 ref.

Descriptors: *Water quality, *Surface waters, *Basic data collections, *Texas, Chemical analysis, Water temperature, Sediment discharge, Discharge measurement, Hydrologic data.
Identifiers: Water resources data.

Water-resources data for the 1969 water year (Oct. 1, 1968 to Sept. 30, 1969) for Texas include records of data for the chemical and physical charac-

teristics of surface water. Records for a few pertinent watercquality stations in bordering States are also included. The water-quality records for surface waters include descriptions of the sampling stations and tabulations of the data for the samples analyzed. The description of the sampling station gives the location, drainage area, periods of record for the various water-quality data, extremes of the pertinent data, and general remarks. Tables include chemical, biological, microbiological, water temperature, and fluvial sediment data. (Myers-USGS)
W72-07029

A METHOD OF SUSPENDING MULTIPLE BASKET SAMPLERS IN RESERVOIRS,
Robert S. Kerr Water Research Center, Ada, Okla.
R. D. Kreis, and R. L. Smith.
Progressive Fish-Culturist, Vol. 32, No. 3, p 182-183, 3 fig, July 1970.

Descriptors: *Sampling, *Reservoirs, Installation, Equipment, Water sampling, On-site investigations.
Identifiers: *Artificial substrates, *Macroinvertebrates, Suspension.

Limestone-filled artificial substrate samplers used to collect macroinvertebrates in an Oklahoma reservoir were suspended in replicates at three depths. The design and installation of the suspension systems are described. (See also W72-07124) (EPA abstract)
W72-07123

THE USE OF LIMESTONE-FILLED BASKET SAMPLERS FOR COLLECTING RESERVOIR MACROINVERTEBRATES,
Robert S. Kerr Water Research Center, Ada, Okla.
R. D. Kreis, R. L. Smith, and J. E. Moyer.
Water Research, Vol. 5, p 1099-1106, 3 fig, 2 tab, 9 ref, Nov. 1971. EPA Program 10000--05/71.

Descriptors: *Sampling, *Test procedures, *Reliability, *Reservoirs, Light penetration, Thermal stratification, Equipment.
Identifiers: *Sample depth, *Macroinvertebrates, *Artificial substrates.

Limestone-filled basket samplers were suspended in a southern Oklahoma reservoir to determine macroinvertebrate colonization potentials and optimum sampling depth for the collection of the greatest diversity of organisms. Duplicate samplers were placed near the surface, 4-ft and 8-ft depths at four separate sampling stations. The optimum sampling depth was found to be near the surface at all stations. Samples suspended side by side yielded results which were in agreement. Statistically significant differences in the relative abundance of macroinvertebrates that inhabited the samplers were found between the surface samples and the 4- and 8-ft samples. (See also W72-07123) (EPA abstract)
W72-07124

1971 NEW PRODUCTS REVIEW.
For primary bibliographic entry see Field 05G.
W72-07130

AUTOMATED FLUOROMETRIC ANALYSIS OF MICROMOLAR QUANTITIES OF ATP, GLUCOSE, AND LACTIC ACID,
York Univ. (England). Dept. of Biology.
H. J. Leese, and J. R. Bronk.
Analytical Biochemistry, Vol. 45, No. 1, p 211-221, January 1972. 4 fig, 2 tab, 9 ref.

Descriptors: Fluorometry, Laboratory equipment, Fluorescence.
Identifiers: Lactic acid, Lactate, ATP, Glucose, Hexokinase, Glucose-6-phosphate, NADH, NAD, NADP, NADPH, Glucose-6-phosphate dehydrogenase, Hydrazine, Lactic dehydrogenase, Pyruvate hydrazone, Tissue, Adenosine triphosphate, Detection limits, Precision, Biological samples, Autoanalyzer.

Automated enzymatic fluorometric analysis of small quantities of metabolites, ATP, glucose, and lactic acid is possible with the Auto analyzer fluorometer II system and a designed flow system. The method is based on the following reactions: (1) with hexokinase as enzyme, ATP, + glucose goes to ATP + glucose-6-phosphate; (2) glucose 6-PO4 + NADP (+) using glucose-6-PO4 dehydrogenase as enzyme forms 6-phosphogluconic acid + NADPH + H (+). The fluorescence of NADPH formed is a measure of the amount of ATP or glucose - whichever is limiting. The assay for lactic acid depends upon the formation of pyruvate and NADH; i.e., L-lactate + NAD (+) + hydrazine with lactic dehydrogenase as enzyme goes to pyruvate hydrazone + NADH + H (+). NADH + NADPH are excited at 350 millimicrons and their fluorescence measured at 450 millimicrons. The procedure calls for passage of high standard samples, water blanks, and additional samples through the apparatus according to the flow diagram. Results are automatically recorded and standard curves drawn for each substrate. Tissue extracts were analyzed for ATP with the procedure to compare the results with those obtained from a manual spectrophotometric method. The values agreed to within 3 percent. The sensitivity of the method is shown by the fact that .000002 M ATP produced full scale meter deflection and .000005 M glucose and .000001 M lactate produced 80 percent deflection. Use of large quantities of enzymes allows greater sensitivity. With this procedure, as many as 40 determination/hr can be carried out with negligible contamination between successive samples. In addition, the cost is below that for equivalent manual spectrophotometric procedures. (Mackan-Battelle)
W72-07134

URANIUM IN RUNOFF FROM THE GULF OF MEXICO DISTRIBUTIVE PROVINCE: ANOMALOUS CONCENTRATIONS,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W72-07135

DETERMINATION OF CARBONATE-14 C BY LIQUID SCINTILLATION COUNTING,
Wayne State Univ., Detroit, Mich. Dept. of Biochemistry.
A. C. Kuyper, and M. Aghdashi.
Analytical Biochemistry, Vol. 45, No. 1, p 341-343, January 1972. 1 fig, 1 tab, 8 ref.

Descriptors: *Radioactivity techniques, *Carbonates, Carbon radioisotopes, Metabolism, Laboratory equipment, Tagging, Tracers.
Identifiers: *Liquid scintillation counting, Carbon-14, Chemical recovery, Blood, Biological samples.

Difficulty arises in the direct measurement by liquid scintillation counting of radioactive carbonate present in solutions of inorganic salts due to the insolubility of carbonate salts in scintillation solutions. A method which is simple, highly accurate, and is especially well adapted to measurement of radioactive carbon dioxide formed in metabolism, such as bicarbonate in blood or respiratory CO2 collected in a NaOH solution, employs preliminary distillation or diffusion of the carbonate salts into an organic base. The diffusion apparatus consists of a scintillation vial, an inner cup and a cap with a small hole to pass a No. 22 needle. The solutions are placed in the cup, rotated 1 hr. and the radioactivity counted. When 0.3N sodium carbonate acts as carrier, the recovery of radioactive carbonate after 1 hr diffusion is better than 98 percent, and increases to 99 percent after diffusion for 5 hours. (Mackan-Battelle)
W72-07136

COMPARATIVE STUDY OF SPECIES NAUTOCOCCUS MAMMILATUS AND NAUTOCOCCUS PYRIFORMIS (TETRASPORALES),
Ceskoslovenska Akademie Ved, Trebon. Lab. of Algology.
For primary bibliographic entry see Field 05C.
W72-07141

THE COURSE OF MINERAL NUTRIENT CONSUMPTION IN THE CULTURING OF SCENEDESMUS QUADRICAUDA, (TURP.) BREB. PART 3. NITROGEN UPTAKE, (IN GERMAN),
Ceskoslovenska Akademie Ved, Trebon. Lab. of Algology.
For primary bibliographic entry see Field 05C.
W72-07142

THE MICROCHAMBER CULTIVATION OF ALGAE,
Ceskoslovenska Akademie Ved, Brno. Lab. of Scientific Film.
For primary bibliographic entry see Field 05C.
W72-07144

OPTICAL DENSITY PROFILES AS AN AID TO THE STUDY OF MICROSTRATIFIED PHYTOPLANKTON POPULATIONS IN LAKES,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 05C.
W72-07145

STUDIES ON MORPHOLOGY, NUTRITIONAL REQUIREMENTS, BIOCHEMICAL ACTIVITY AND ANTIBIOTIC RESISTANCE OF HETEROTROPHIC WATER BACTERIA,
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology; and Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
For primary bibliographic entry see Field 05C.
W72-07146

BIODEGRADATION OF SYNTHETIC DETERGENTS EVALUATION BY COMMUNITY TRIALS, PART 2: ALCOHOL AND ALKYLPHENOL ETHOXYLATES,
Shell Research Ltd., Egham (England). Egham Research Lab.
For primary bibliographic entry see Field 05D.
W72-07148

BIODEGRADATION OF SYNTHETIC DETERGENTS EVALUATION BY COMMUNITY TRIALS, PART 3: PRIMARY ALCOHOL SULPHATES,
Shell Research Ltd., Egham (England). Egham Research Labs.
For primary bibliographic entry see Field 05D.
W72-07149

CHAR-ASHING OF GLYCERIDE OILS PRELIMINARY TO THE ATOMIC ABSORPTION DETERMINATION OF THEIR COPPER AND IRON CONTENTS,
Northern Regional Research Lab. Peoria, Ill.
C. D. Evans, G. R. List, and L. T. Black.
Journal of the American Oil Chemists' Society, Vol. 48, No. 12, p 840-842, December 1971. 3 tab, 15 ref.

Descriptors: *Copper, *Iron, *Oil, Pollutant identification, Chemical analysis, Catalysts, Heavy metals.
Identifiers: *Char-ashing, Glyceride oil, Soybean oil, Edible oils, Copper chromite, Catalysts, Copper salts, Vegetable oil, Sample preparation, Laboratory techniques, Atomic absorption spectrophotometry, Detection limits, Precision, Chemical recovery.

Trace amounts of copper and iron were determined by char-ashing samples of molecularly

distilled glyceride oil, copper hydrogenated edible oils, and salad oils with added copper salts and copper chromite catalysts. The soybean oil used was a commercial sample of a nonhydrogenated salad oil selected because of its low metal content. In a 350 ml vycor dish, 150 g of oil was charred on a full heat controlled hotplate at 300C for about 24 hours. After charring, the dishes were ignited in a lined muffle furnace at 500C for 16 hours. The resulting ash was dissolved in 10 ml of 5 percent high purity sulfonic acid and after a 30 min acid digestion on a hot plate, the sample was washed into a 25 ml flask. A second digestion with 5 ml acid was performed and added to the flask. Samples and control blanks were aspirated directly into the atomic flame without further dilution or concentration. All samples were run on a Perkin Elmer 303 atomic absorption spectrophotometer equipped with a 3 slot titanium Boling burner. The metals were found at 0.025 plus or minus 0.002 ppm for copper and 0.082 plus or minus 0.012 ppm for iron. Percent recovery was 97.9 percent for Cu, 87.2-93.2 percent for Fe. The coefficent of variation was 14.8 percent for Cu, 11.8 percent for Fe. An advantage over the direct method is the ability for analysis at much lower levels. (Mortland-Battelle)
W72-07150

PREPARATION OF LARGE BORE OPEN TUBULAR COLUMNS FOR GC,
Western Regional Research Lab., Albany, Calif.
T. R. Mon.
Research/Development, Vol. 22, No. 12, p 14-17, December 1971. 7 fig.

Descriptors: *Gas chromatography, Laboratory equipment, Chemical analysis, Chromatography.
Identifiers: *Open tubular columns, *Column cleanup, Coating.

Surprisingly durable columns for high resolution GC can be prepared by proper cleaning, coating and conditioning of open tubular stainless steel columns. Cleaning is accomplished by washing with 450 to 600 cc or more of each of the following in this order: chloroform, acetone, water, concentrated nitric acid, water, 10 percent potassium hydroxide in 1:1 water plus methanol, water, concentrated nitric acid, water, concentrated ammonium hydroxide, water, acetone and finally acetone. 140 to 150 cc slugs of cleaning solution are charged through the column under nitrogen pressure at injection ends. Coating is also accomplished by the slug method, allowing thicker coatings with higher nitrogen pressures (due to increased solvent evaporation) or thinner coating with lower pressures. Most columns are conditioned at 175 to 200 C from 2 days to 1 week in a conditioning oven with nitrogen flow applied at the detector end. This rigorous conditioning helps minimize column bleeding while reversed nitrogen flow helps minimize any uneven distribution of the stationary phase of the coating. (Mackan-Battelle)
W72-07151

DETERMINATION OF SULFATE IONS IN THE WASTE WATERS OF ELECTROPLATING SHOPS (EXCHANGE OF EXPERIENCE),
Kazan Mechanical Plant (USSR).
F. I. Kotik.
Zavodskaya Laboratoriya, Vol. 37, No. 5, p 689, May 1971. 1 tab, 1 ref.

Descriptors: *Waste water (Pollution), *Water analysis, *Volumetric analysis, *Gravimetric analysis, *Color reactions, *Sulfates, Ions, Methodology, Chromatography, Aqueous solutions, Water analysis.
Identifiers: Column chromatography, Chemical interference, Ionic interference, Electroplating wastes.

An accelerated titrimetric method has been proposed for determining sulfate ions in waste water without previous concentration of the sample. The method consists of direct titration of the sample with barium chloride in the presence of a metal indicator - carboxyarsenazo - in a 50 percent aqueous alcohol medium at pH 5.5-6.5. Interfering cations are removed by passing the sample through a KU-2 cationite chromatographic column. Samples of synthetic waste waters were analyzed gravimetrically and volumetrically for the presence of sulfate ions. The comparative results are tabulated and show a deviation of plus or minus 0.17 percent with respect to the gravimetric method of analyzing industrial waste waters. (Holoman-Battelle)
W72-07154

KINETIC METHOD FOR DETERMINING BROMIDE IONS IN WATER USING CHROMOTROPE 2B,
Donetsk Polytechnic Inst. (USSR).
M. P. Babkin.
Zavodskaya Laboratoriya, Vol. 37, No. 5, p 664-665, May 1971. 2 tab, 3 ref.

Descriptors: *Aqueous solutions, *Water analysis, *Color reactions, Ions, Mine water, Acid mine water, Inorganic compounds, Methodology, Chlorides, Chemical analysis.
Identifiers: *Bromides, *Chromotrope 2B, Sample preparation, Iodides, Ammonium sulfate, Potassium acetate, Potassium nitrate, Magnesium bisulfate, Iron sulfate, Aluminum ammonium alum, Mohr salts, Chemical interference.

A method has been proposed for determining bromide ions in water using chromotrope 2B (an acid dye). This method is based on the measurement of reaction time between chromotrope 2B and bromine. Chloride ions, depending on the bromide concentration in the solution, accelerate the reaction time while inorganic salts inhibit the reaction. Iodides in concentrations of less than 5 mg per liter have virtually no effect on the reaction rate. Bromide content in 20 samples of mine water and in a water-supply sample was determined directly and after evaporation three times or after dilution for large bromide ion contents. The results of the determination were verified by the additive method (2.5 and 3.0 mg/l) and by a method with fuschin sulfuric acid. (Holoman-Battelle)
W72-07155

INVESTIGATION OF COMPLEXES OF LANTHANUM AND LUTETIUM WITH NITRILOTRIACETATE BY NUCLEAR MAGNETIC RESONANCE,
N. A. Kostromina, and N. N. Tananaeva.
Zhurnal Neorganicheskoi Khimii, Vol. 16, No. 3, p 462-463, March 1971. 1 fig, 3 ref.

Descriptors: *Aqueous solutions, Magnesium, Calcium, Chlorides, Water analysis, Hydrogen ion concentration, *Nuclear magnetic resonance, Chemical reactions.
Identifiers: *Nitrilotriacetates, *Rare earth elements, NMR spectra, Lanthanum, Strontium, Scandium, Yttrium, Lutetium, Aluminum, Ligands.

Previous studies of strontium, calcium, magnesium, lanthanum, yttrium, scandium, and alumnium nitrilotriacetates (NTA) have shown that the chemical shift in NTA is a measure of the induction effect in the formation of monotypical complexes. No differences were revealed in lanthanum and yttrium complexes. Studies were consequently undertaken to compare the NMR spectra of the first and last rare earth elements (lanthanum and lutetium) with NTA. Proton resonance spectra of NTA and mixtures of NTA with lanthanum and lutetium chlorides in aqueous solution were recorded at various pH values. The spectra revealed that complexes of NTA with lutetium can be distinguished from those with lanthanum by shifts in signals of bound and free ligands which occur as the pH of the solution is varied. (Holoman-Battelle)
W72-07156

KINETIC DETERMINATION OF ORTHOPHOSPHATE IN THE PRESENCE OF CONDENSED PHOSPHATES,
Akademiya Nauk URSR, Kiev. Instytut Fizychoi Khimii.
E. E. Kriss, V. K. Rudenko, and G. T. Kurbatova.
Zhurnal Analiticheskoi Khimii, Vol. 26, No. 5, Pt. 2, p 893-895, May 1971. 3 fig, 1 tab, 5 ref.

Descriptors: *Phosphates, *Chemical reactions, *Kinetics, Molybdenum, Nutrients, Hydrolysis, Reduction (Chemical), Trace elements, Colorimetry.
Identifiers: *Orthophosphates, Pyrophosphates, Tripolyphosphate, Phosphomolybic acid, Detection, Pho limits, Photoelectric colorimeter, Absorbance, Molybdate, Laboratory techniques.

A kinetic method based on the formation of molybdenum blue is used to determine small amounts of orthophosphate in the presence of condensed phosphates. The chemical reaction involves the formation of phosphomolybdic acid by reducing molybdate to yield the 'blue' in strongly acid solutions (0.05-0.2 M). The reaction rate is accelerated by orthophosphate; therefore orthophosphate can be determined in the presence of 20-30 times its amounts of pyro- and tripolyphosphates. The recommended method for determining orthophosphate in mixtures involves placing solutions of (1) sodium molybdate, (2) ascorbic acid and sulfuric acid, and (3) a mixture of sodium orthophosphate and condensed phosphate solutions in the three side arms of the mixing vessel and heating at 25 degree C for 10-15 min, and mixing. One minute after placing the mixed solution in the thermostatted compartment of a photoelectric colorimeter, a curve showing change in absorbance of the 'blue' solution was recorded over a 15-17 minute period. Orthophosphate concentration was determined from a calibration curve obtained by plotting the change in absorbance at the fourteenth and twelfth minute after the start of the reaction against orthophosphate concentration for the same time periods. The lowest orthophosphate concentration that can be determined is 0.01 micrograms per milliliter. (Jefferis-Battelle)
W72-07157

DETERMINATION OF COPPER, PALLADIUM, ANTIMONY, AND BISMUTH,
Punjabi Univ., Patiala (India).
A. L. J. Rao, and B. K. Puri.
Zhurnal Analiticheskoi Khimii, Vol. 26, No. 5, Pt. 2, p 888-890, May 1971. 2 tab, 9 ref.

Descriptors: *Copper, *Volumetric analyses.
Identifiers: *Palladium, *Antimony, *Bismuth, Chemical interference, Aniline, Complex compounds, Iodides, Thiocyanates, Diphenylcarbazone, Tartaric acid.

Copper, palladium, antimony, and bismuth, can be titrimetrically determined by precipitating these metals in the presence of aniline and an excess of thiocyanate (in the case of Cu) or iodide (in the case of Pd, Sb, and Bi). Excess of thiocyanate or iodide is determined mercurimetrically, diphenylcarbazone being used as the indicator. Copper is quantitatively precipitated as the aniline-thiocyanate complex at pH 3-5, palladium as the aniline-iodine complex at pH 2-4, and bismuth as the aniline-iodine complex at pH less than 2. A method has also been developed for determining antimony and bismuth in the same sample by dissolving the antimony complex precipitate in tartaric acid. It is noted that gold interferes with the copper determination; copper, silver, gold, bismuth and lead interfere in the palladium determination; and lead and silver interfere with antimony and bismuth determinations. No method is given for eliminating these interferences. (Jefferis-Battelle)
W72-07158

DETECTION AND QUANTITATIVE DETERMINATION OF SUBMICROAMOUNTS OF

RUTHENIUM IN THE ZONES ON PAPER CHROMATOGRAMS AND ELECTROPHOREGRAMS BY A KINETIC METHOD,
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analiticheskoi Khimii.
G. M. Varshal, I. Ya. Koshcheva, R. P. Morozova, and O. N. Konopleva.
Zhurnal Analiticheskoi Khimii, Vol. 26, No. 5, Pt. 2, p 829-832, May 1971. 2 fig, 1 tab, 10 ref.

Descriptors: *Trace elements, *Water analysis, Chemical analysis, Electrophoresis, Separation techniques, Colorimetry, Methodology, Water pollution, Fulvic acids, Organic matter, Kinetics, Chemical reactions, Ions, Kinetics, Analytical techniques, Chromatography.
Identifiers: *Ruthenium, *Paper chromatography, *Paper electrophoresis, Electrophoregrams, Chromatograms, Detection limits, Electromigration.

The use of a catalytic method based on the formation of colored products makes possible at least a ten-fold increase in sensitivity for detecting and quantitatively determining minute quantities of ruthenium on chromatogram and electrophoregram zones. Reference chromatograms were prepared in order to (1) test the catalytic method and assess its sensitivity and (2) detect ruthenium quantitatively in the zones on chromatograms and electrophoregrams. Reference chromatograms for qualitative determinations were prepared on perchlorate treated sheets and a mixture of benzidine, hydrogen peroxide, acetate buffer and HCL was used as the developer which yielded a bright blue ruthenium zone. Chromatograms prepared using a photoelectric colorimeter supplied the data for the calibration curve which was used in determining ruthenium concentrations. With this method, (1) it is possible to detect 0.01 micrograms of Ru in its zone, and (2) the sensitivity of quantitative determinations is 0.1 micrograms, the standard deviation being not greater than 10-11 percent over the range 0.1-4 micrograms. The method was used in studying the state of submicroamounts of Ru in solution by paper electrophoresis. (Jefferis-Battelle)
W72-07159

REGULATION OF CONTINUOUS CULTIVATION OF CANDIDA TROPICALIS BY ALTERATION OF PH OF MEDIUM,
Institut Fiziki, Krasnoyarsk (USSR).
For primary bibliographic entry see Field 05C.
W72-07160

A FLEXIBLE COMPUTER PROGRAM FOR CALCULATIONS IN EMISSION-SPECTROGRAPHIC ANALYSIS,
Atomic Energy Research Establishment, Harwell (England).
B. L. Taylor, and F. T. Birks.
Analyst, Vol 96, No 11418, p 753-763, November 1971. 3 fig, 4 ref.

Descriptors: *Spectroscopy, *Computer programs, Automation, Statistical methods, Data processing, Evaluation, Calirations, Computers, Laboratory equipment, Heavy metals, Trace elements.
Identifiers: Fortran IV, Emission spectroscopy, Emulsion calibration, Data interpretation.

A computer program has been written in Fortran IV to evaluate for spectrochemical analysis spectral information stored on photographic plates. With this program, ratios of line intensities are calculated from microphotometer readings; it includes the computation of the emulsion calibration function using either the two-step or seven-step method. A formatless data input technique is employed and use is made of descriptive headings and labels to facilitate the introduction of data. These headings and the codes used for labelling the readings are chosen so as to be readily understood by the spectrographer. The program is characterized by considerable flexibility with regard to the number of spectra and number of analytical and internal standard lines that can be used. The maximum number of spectra that can be evaluated is sixty and up to nineteen analytical lines can be present in each spectrum. The program contains many data checks, together with appropriate diagnostic messages which are designed to avoid the presence of undetected errors in the results. The program has been successfully used for 3 years in an emission spectroscopy laboratory in England to deal with a wide variety of analyses, such as heavy metals. (Mortland-Battelle)
W72-07161

EFFECT OF MICROORGANISMS ON THE PROPERTIES OF OIL FUELS,
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 05C.
W72-07162

METHODS AND INSTRUMENTS. SOME RESULTS OF USING AN UNDERWATER LABORATORY IN OCEANOGRAPHIC RESEARCH,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 07B.
W72-07164

STATISTICAL EVALUATION OF THE RESULTS OBTAINED BY QUANTITATIVE REDUCTION OF A BIOLOGICAL SAMPLE,
All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
V. V. Krylov.
Okeanologiya, Vol 11, No 2, p 252-254, 1971. 1 tab, 5 ref.

Descriptors: *Evaluation, *Numerical analysis, *Statistical methods, Copepods, Biomass, Sampling, Plankton, Measurement.
Identifiers: *Pascal distribution, *Biological samples, *Quantitative reduction, Calanus sinicus, Paracalanus panvus, Euchaeta plana, Pareuchaeta, Coefficient of variation, Data interpretation.

Pascal distribution, which can be used to describe mathematically the distribution of organisms in a large sample by analyzing a subsample, has been evaluated with plankton samples collected in the East China Sea on May 8, 1963. The numbers and biomass of calanoid copepods were determined. The biomass is determined by first homogenizing the sample. The total weight of Calanoida is about 390 plus or minus 27 mg and the count is 1581 plus or minus 152 at the 5 percent significance level. (Holoman-Battelle)
W72-07165

PHOSPHORUS UPTAKE BY PLANKTONIC ALGAE IN THE DARK AND UNDER FAINT LIGHT,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 05C.
W72-07166

DISTRIBUTION OF TAXOCENOSES OF FORAMINIFERA ON THE CONTINENTAL TERRACE OF SOUTH AMERICA IN THE PACIFIC,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 05C.
W72-07167

DISTRIBUTION OF FORAMINIFERA ALONG THE PACIFIC COAST OF SOUTH AMERICA,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 05C.
W72-07168

RESPIRATION RATE OF AQUATIC MICROFLORA IN GLASS CONTAINERS WITH DIFFERENT VOLUMES,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 05C.
W72-07170

MICROBIOLOGICAL PROCESSES IN LAKE MEKHTEB,
Dagestanskii Nauchno-Issledovatelskii Institut Selskogo Khozyaistva, Makhachkala (USSR). Dagestan Scientific-Research Institute of Agriculture, Makhachkala.
For primary bibliographic entry see Field 05C.
W72-07171

SPECTROCHEMICAL PERFORMANCE OF A COMPUTER-CONTROLLED DIRECT READING SPECTROMETER,
Rank Precision Industries Ltd., London (England). Analytical Div.
For primary bibliographic entry see Field 07B.
W72-07173

THE APPLICATION OF ATOMIC SPECTROSCOPY TO CLINICAL PATHOLOGY,
Hospital for Sick Children, London (England).
H. T. Delves.
Proceedings of the Society for Analytical Chemistry, Vol 8, No 11, p 250-252, November 1971. 16 ref.

Descriptors: *Pathology, Spectroscopy, Heavy metals, Urine, Spectrophotometry, Neutron activation analysis, Sodium, Potassium, Calcium, Iron, Magnesium, Copper, Chromium, Molybdenum, Manganese, Cobalt, X-ray fluorescence, Trace elements.
Identifiers: *Biological samples, *Tissue, Body fluids, Serum, Zinc, Lithium, Lead, Blood, Flame emission spectrophotometry, Atomic absorption spectrophotometry, Mass spectroscopy, D. C. arc emission spectroscopy, Flame emission spectroscopy, X-ray fluorescence, Spectroscopy.

Metals in human tissue, blood, and fluids may be determined by spectrophotometry and spectroscopy using either single-element analyses or multi-element analyses. The procedures, problems, and advantages of atomic absorption and flame emission spectrophotometry, spark source mass spectroscopy, neutron activation analysis, d.c. arc emission spectroscopy, and x-ray fluorescence in analyzing biological samples for sodium, potassium, calcium, iron, magnesium, copper, chromium, molybdenum, manganese, cobalt, zinc, lithium and lead are briefly discussed. (Mortland-Battelle)
W72-07174

THE ATOMIC-FLUORESCENCE DETERMINATION OF MERCURY BY THE COLD VAPOUR TECHNIQUE,
Shandon Southern Instruments Ltd., Camberley (England).
K. C. Thompson, and G. D. Reynolds.
Analyst, Vol 96, No 1148, p 771-775, November 1971. 3 fig, 9 ref.

Descriptors: *Heavy metals, *Spectrophotometry, Pollutant identification, Instrumentation, Urine, Laboratory equipment, *Mercury.
Identifiers: *Atomic fluorescence spectrophotometry, Cold vapor techniques, Detection limits, Sample preparation, Laboratory techniques.

Atomic fluorescence in conjunction with the cold-vapor technique is shown to be a simple, sensitive, and specific method for determining low levels of mercury. When compared to established atomic absorption technique, it shows distinct advantage: there is no enclosed coil; no spurious signal from broad band absorption by organic contaminants; no recirculation system or drying column required; the sensitivity is high; and the calibration graph is

linear over a wide concentration range. The procedure requires removing the burner and lenses from an atomic-absorption emission spectrophotometer and mounting a mercury lamp in the fluorescence position, so as to minimize specular reflection. The light is directed over the top of a Pyrex tube connected to the mercury generation system. Mercury is liberated in a cell and an air and argon mixture is bubbled through the cell and an expansion chamber. This tends to smooth the flow of mercury through a tube where it fluoresces near the lamp. The fluorescence signal is displayed on a recorder. Reducing agents of tin (II) chloride, hydrochloric acid, and sulphuric acid were used in analyzing solutions of mercury and urine. (Mortland-Battelle)
W72-07175

CHARACTERIZATION OF INDOLES BY THIN--LAYER CHROMATOGRAPHY AND IN SITU FLUOROMETRY,
Dalhousie Univ., Halifax (England). Dept. of Chemistry.
J. D. Macneil, M. Hausler, R. W. Frei, and O. Hutzinger.
Analytical Biochemistry, Vol 45, No 1, p 100-106, January 1972. 1 tab, 22 ref.

Descriptors: *Fluorescence, Laboratory equipment, Chemical analysis, Separation techniques, Fluorometry.
Identifiers: *Indoles, *Thin layer chromatography, Detection limits, Biological samples, Serotonin oxalate, In-situ fluorometry, Acid spray, Emission maxima, Excitation maxima.

By using a combination of thin-layer chromatography and in situ fluorescence, it is possible to characterize natural and synthetic indoles in microgram quantities. Detection limits of 0.03-0.05 micrograms are possible using the native fluorescence of the indoles in the ultraviolet range. Excitation maxima is on the range 285-310 mm and emission maxima in the range 345-360 mm. Acid spraying (dilute 0.1N H2 SO4 in methanol) produces an additional pair of maxima with excitation at 350 mm and emission at 450 mm. Polar compounds in the spray, such as dimethyl sulfoxide on sulfuric acid, enhance the indole fluorescence. The procedure should find application to biological samples. (Mackan-Battelle)
W72-07176

2, 5-DI- (BENZOXAZOLE-2-YL)THIOPHENE, AN OPTICAL BRIGHTENER CONTAMINATING SLUDGE AND FISH,
Lantbrukhogskolan, Uppsala (Sweden). Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W72-07222

AUTOMATIC RECOGNITION OF MUSKEG FROM AERIAL PHOTOGRAPHS,
New Brunswick Univ., Fredericton. Dept. of Surveying Engineering.
For primary bibliographic entry see Field 07C.
W72-07226

SUSPENDED MATTER IN THE CARIBBEAN SEA: A GRAVIMETRIC ANALYSIS,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 02J.
W72-07229

METHODS FOR ANALYSIS OF ORGANIC SUBSTANCES IN WATER,
Geological Survey, Washington, D.C.
D. F. Goerlitz, and E. Brown.
Available from GPO, Washington, DC 20402-Price 50 cents, stock number 2401-1227. Geological Survey Techniques of Water-Resources Investigations, Book 5, Laboratory Analysis, Chapter A3, 1972. 40 p, 4 tab.

Descriptors: *Water analysis, *Pollutant identification, *Organic matter, *Pesticides, Color, Chemical analysis, Nitrogen, Ammonia, Chemical oxygen demand, Gas chromatography, Testing, Laboratory tests, Water quality.

This manual contains methods used by the U.S. Geological Survey for the determination of organic substances in water. Procedures are included for the following categories of organic substances: Organic carbon, chlorophylls, color, detergents, nitrogen, oils and waxes, oxygen demand (chemical), phenolic materials, herbicides, and insecticides. Procedures are also given for the determination of chlorinated hydrocarbon insecticides, as well as chlorinated phenoxy acid herbicides, in sediment and bottom materials. (Knapp-USGS)
W72-07230

INCIDENCE OF SALMONELLA IN SAMPLES OF POULTRY FEED AND DRINKING WATER COLLECTED AT SITE OF INGESTION,
Kansas State Univ., Manhattan. Dept. of Dairy and Poultry Science.
M. S. Duncan, and A. W. Adams.
Poult Sci. 50 (2): 653-654. 1971.
Identifiers: Drinking, Feed, Incidence, Ingestion, Poultry, Proteus, Salmonella, Samples, Site.

A survey for Salmonella in feed and water samples from Kansas poultry units was analyzed. All feed and water samples were negative for Salmonella. Some Proteus was isolated.--Copyright 1971, Biological Abstracts, Inc.
W72-07259

5B. Sources of Pollution

EPIDEMIC OF MERCURY POISONING IN THE AGANO RIVER AREA: AN INTRODUCTORY REVIEW,
Keio Univ., Tokyo (Japan). School of Medicine.
For primary bibliographic entry see Field 05C.
W72-06580

AGRICULTURE'S EFFECT ON NITRATE POLLUTION OF GROUNDWATER,
Agricultural Research Service, Fort Collins, Colo.
B. A. Stewart, F. G. Viets, Jr., and G. L. Hutchinson.
Journal of Soil and Water Conservation, Vol 23, No 1, p 13-15, January-February, 1968. 1 fig, 1 tab, 8 ref.

Descriptors: *Nitrate, *Water pollution, *Fertilizers, *Soil profiles, *Groundwater, *Agriculture, *Wastes, Alfalfa, Grasslands, Feedlots.
Identifiers: Irrigated row crops, Domestic wells.

Contributions of fertilizers applied to soil and wastes from concentrated livestock feeding operations to pollution of groundwater were studied in the middle South Platte River Valley in Colorado. Amounts of nitrate moving through 129 soil profiles varied widely with land use. Average total nitrate N to a depth of 20 ft in lbs/acre was 1436 under feed-lots, 506 under irrigated row crops, 261 under dryland row crops, 90 under native grassland, and 79 under alfalfa. The average annual loss of N to groundwater under irrigated row crops was estimated at 25-30 lbs/acre. Feedlots located near homesteads had much more effect on nitrate content of water from domestic wells than did cropped land. (Skogerboe-Colorado State)
W72-06598

MATHEMATICAL MODELS FOR THE PREDICTION OF TEMPERATURE DISTRIBUTIONS RESULTING FROM THE DISCHARGE OF HEATED WATER INTO LARGE BODIES OF WATER,
Tetra Tech, Inc., Pasadena, Calif.
C. Y. Koh, and Loh-Nien Fan.
Available from the National Technical Information Service as PB-208 034, $0.95 in microfiche. Environmental Protection Agency-Water Quality Office, Water Pollution Control Research Series, October 1971, 219 p. FWQA Program 16130D-WO10/70, Contract No. 14-12-570.

Descriptors: *Mathematical model, *Outfalls, *Thermal pollution, *Hydraulic jump, Model studies, Heated water, *Thermal stratification, *Forecasting, Path of pollutants, Water pollution sources.
Identifiers: *Thermal outfalls.

Mathematical models for heated water outfalls were developed for three flow regions. Near the source, the subsurface discharge into a stratified ambient water issuing from a row of buoyant jets was solved with the jet interference included in the analysis. The analysis of the flow zone close to and at intermediate distances from a surface buoyant jet was developed for the two-dimensional and axisymmetric cases. Far away from the source, a passive dispersion model was solved for a two-dimensional situation taking into consideration the effects of shear current and vertical changes in diffusivity. A significant result from the surface buoyant jet analysis is the ability to predict the onset and location of an internal hydraulic jump. Prediction can be made simply from the knowledge of the source Froude number and a dimensionless surface exchange coefficient. Parametric computer programs of the models are also developed. (Shirazi-EPA)
W72-06613

POTENTIAL ENVIRONMENTAL EFFECTS OF AN OFFSHORE SUBMERGED NUCLEAR POWER PLANT, VOLUME I.
General Dynamics Corp., Groton, Conn. Electric Boat Div.
For primary bibliographic entry see Field 05C.
W72-06614

POTENTIAL ENVIRONMENTAL EFFECTS OF AN OFFSHORE SUBMERGED NUCLEAR POWER PLANT, VOLUME II.
General Dynamics Corp., Groton, Conn. Electric Boat Div.
For primary bibliographic entry see Field 05C.
W72-06615

EFFECT OF GEOGRAPHICAL LOCATION ON COOLING POND REQUIREMENTS AND PERFORMANCE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 05G.
W72-06618

WATER POLLUTION CONTROL LEGISLATION, AGRICULTURAL RUNOFF, PART 6.
Congress, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-06633

WATER POLLUTION POTENTIAL ESTIMATED FROM FARM NUTRIENT BUDGETS,
Connecticut Agricultural Experiment Station, New Haven.
C. R. Frink.
Agronomy Journal, Vol. 61, No. 4, p 550-553, July-August, 1969. 3 fig, 3 tab, 15 ref.

Descriptors: *Water pollution sources, *Nutrients, *Nitrogen, *Phosphorus, Potassium, Ground water, Eutrophication, Dairy industry, Fertilizers, Agronomy, Pollution abatement.

Estimates of the yield of nutrients to waterways from wooded and cultivated land vary considerably. Some of this variability can be attributed to the large variability in the N and P content of runoff water, to analytic uncertainties, and to the difficulties of obtaining accurate flow measurements. As an alternative assessment of

agricultural eutrophication, nutrient budgets were derived for the highly specialized dairy farms in the Northeast. This analysis showed that under certain conditions these dairy farms could contribute significant amounts of nutrients, particularly nitrate, to ground water. However, this loss of nutrients can be minimized by providing adequate cropland per cow, by selecting crops and animals that are efficient users of N, and by applying both manure and commercial fertilizers during the growing season. (Skogerboe-Colorado State)
W72-06676

REDUCTION OF SULFATE TO SULFIDE IN WATERLOGGED SOIL,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
W. E. Connell, and W. H. Patrick, Jr.
Soil Science Society of America Proceedings, Vol 33, No 5, p 711-715, September-October, 1969. 6 fig, 1 tab, 9 ref.

Descriptors: *Sulfate, *Sulfides, *Saturated soils, *Anaerobic conditions, Sulfur compounds, *Reduction, Soil chemistry, Oxidation-reduction potential.

A study was made of sulfate reduction to sulfide in waterlogged soils supplied with an energy source. Sulfate reduction was more rapid in surface soil than in subsurface layers with sulfide appearing 2 days after waterlogging samples of a surface soil. The amount of sulfide precipitated from added H2S in two soils was approximately equivalent to the amounts of ferrous iron released by waterlogging. Added Fe2O3 was effective in precipitating H2S. Sulfate reduction was retarded by nitrate. Addition of oxygen to highly reduced soils caused a rapid decrease in sulfide content, with one-half of the sulfide being oxidized in 15 minutes and all the sulfide oxidized after 8 hours. (Skogerboe-Colorado State)
W72-06678

FLUORIDE IN DRINKING WATER AND EXPERIMENTAL DENTAL CARIES IN RATS,
Aichi-Gakuin Univ. (Japan). School of Dentistry.
Shiro Furukawa.
Aichi-Gakuin J Dent Sci. 7 (1): 48-61. 1969.
Identifiers: Caries, Dental, Drinking, Fluoride, Lactobacillus, Rats, Streptococcus.

Sprague-Dawley rats were divided into 4 groups: normal diet-pure water group, normal diet-25 ppm of F water group, cariogenic diet-pure water group, and cariogenic diet-25 ppm of F water group. The occurrence of experimental caries was prevented by drinking F water. In the F water group, a high degree of F deposition in incisor and femur was recognized. There was no marked difference in hardness of enamel between F and pure water groups. No marked difference between these 2 groups was observed as to viable cell numbers of oral microbes, especially their total cell counts and the movement of acidogenic bacteria such as Lactobacillus and Streptococcus.--Copyright 1971, Biological Abstracts, Inc.
W72-06682

WASTE HEAT INPUTS TO THE GREAT LAKES OF NORTH AMERICA,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
Robert K. Lane.
Presented at Conference in connection with the International Water Conservancy Exhibition at Jonkoping, Sweden, Sept. 2-9, 1970. p 6:43-6:50. 2 fig, 2 tab.

Descriptors: *Thermal pollution, *Great Lakes, *Lake Ontario, Lakes, Path of pollutants, Water temperature, Water pollution sources.

A study has estimated that thermal inputs to the Great Lakes by 2000 will increase by a factor of 11. For Lake Ontario this amounts to 6% of the total natural heat storage. Assuming steady state and complete mixing throughout the lake, the mean lake temperature would increase by 0.5 F0. Evaporation due to thermal loading is predicted to increase from 0.047 inches in 1968 to 0.64 inches in 2000. The nearshore behavior of thermal effluents with respect to the influence of the wind are being studied. When suitable models have been selected they will be applied to each of the lakes in order to determine the thermal consequences of the anticipated waste heat discharge. (Fosdick-CCIW)
W72-06688

PRELIMINARY STUDIES ON THE EFFECT OF THE LAKE ONTARIO THERMAL BAR IN CONFINING BACTERIA TO THE NEAR-SHORE REGION,
Department of National Health and Welfare, Kingston (Ontario). Div. of Public Health Engineering.
A. S. Menon, B. J. Dutka, and A. A. Jurkovic.
Manuscript Report KR 70-2, 1970. 25 p., 6 fig, 4 tab, 12 refs.

Descriptors: *Aquatic bacteria, *Coliforms, *Lake Ontario, Thermal stratification, Water pollution sources.
Identifiers: Thermal bar.

Preliminary studies assessed the influence of the thermal bar in confining bacteria to the inshore area during the spring period of rapid growth. In a time series study two anchor stations, one on either side of the thermal bar, were sampled for coliforms and bacterial biomass. In a second study, a tracer bacteria, Serratia marcescens was released inshore of the thermal bar and water samples from both sides of the thermal bar were tested. Great differences between inshore and offshore bacterial densities and biomass were observed indicating that the thermal bar acts as a barrier and may inhibit the diffusion of bacteria to the offshore area. (Fosdick-CCIW)
W72-06692

STRONTIUM 90--DIFFUSIONAL TRANSPORT IN SEDIMENTS OF THE GREAT LAKES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
A. Lerman, and H. Taniguchi.
Journal of Geophysical Research, Vol 77, No 3, p 474-481, January 20, 1972. 4 fig, 15 ref.

Descriptors: *Path of pollutants, *Strontium radioisotopes, *Fallout, *Bottom sediments, *Great Lakes, Diffusion, Mixing, Lake Superior, Lake Ontario, Sampling, Sedimentation.

The depth of penetration of SR-90 in deep-water sediments of Lake Superior and Lake Ontario was 8-10 cm by 1969. The main mechanisms of transport from lake water into sediment are (a) diffusion of SR-90 in interstitial water, and (b) uptake of SR-90 by solid phases in sediment. A diffusional transport gives SR-90 concentrations in sediment comparable with observed values. The intensity of the diffusional flux into sediment increases with greater uptake by solids. In Lake Ontario, flux into bottom sediments has been removing SR-90 from lake water at the rate of 0.2-0.5% per year, during the period 1954-1969. The slowness of flux compared with the rate of SR-90 removal in lake outflow (12% per year) accounts for the small amount accumulated in sediments (4-6% of SR-90 in lake water) and for the lack of noticeable control of concentrations in lake water by floor sediments. (Knapp-USGS)
W72-06699

SOIL EROSION BY WATER ON UPLAND AREAS,
Agricultural Research Service, Lafayette, Ind.
For primary bibliographic entry see Field 02J.
W72-06763

PLASTICS ON THE SARGASSO SEA SURFACE,
Woods Hole Oceanographic Institution, Mass.
E. J. Carpenter, and K. L. Smith, Jr.
Science, Vol 175, No 4027, p 1240-1241, March 1972. 1 fig, 1 tab, 5 ref. NSF Grant GZ 1508.

Descriptors: *Plastics, *Polychlorinated biphenyls, *Atlantic Ocean, *Water pollution sources, Particle size, Particle shape, Oil wastes, Ocean currents, Waste disposal, Diatoms, Jelly fish, Aquatic bacteria, Marine animals.
Identifiers: *Sargasso Sea, Hydroids.

Plastic particles, in concentrations averaging 3500 pieces and 290 grams per square kilometer, are widespread in the western Sargasso Sea. Pieces are brittle, apparently due to the weathering of the plasticizers, and many are in a pellet shape about 0.25 to 0.5 centimeters in diameter. The particles are surfaces for the attachment of diatoms and hydroids. Increasing production of plastics, combined with present waste-disposal practices, will undoubtedly lead to increases in the concentration of these particles. Plastics could be a source of some of the polychlorinated biphenyls recently observed in oceanic organisms. (Lang-USGS)
W72-06766

HEAVY METALS ANALYSES OF BOTTOM SEDIMENT IN THE POTOMAC RIVER ESTUARY,
Environmental Protection Agency, Annapolis, Md. Field Office.
T. H. Pheiffer.
Technical Report 49, January 1972. 10 p, 20 fig, 9 ref.

Descriptors: *Heavy metals, *Water pollution sources, *Estuaries, *Bottom sediments, *Potomac River, District of Columbia, Sampling, Data collections, Chemical analysis, Water quality, Water properties, Streamflow.

The occurrence of heavy metals in the waters and in the bottom sediment of the Potomac Estuary (Washington, D.C. area) was investigated during August and September 1970, and again in April 1971. Small concentrations of zinc and manganese were detected in the overlying waters of the estuary, and considerable amounts of various heavy metals were recorded by acid extraction determination from the sediment. Significant increases of lead, cobalt, chromium, cadmium, copper, nickel, zinc, silver, barium, aluminum, iron, and lithium in the upper estuary in an area above the Woodrow Wilson Bridge were in excess of concentrations measured above and below this area. Of the metals measured in April 1971, all showed increases in concentrations in this area, but the concentrations were lower than those detected in August and December of 1970. This is attributed to the high-flow conditions of February and March 1971 causing a more even distribution of metals below Woodrow Wilson Bridge. (Woodard-USGS)
W72-06772

PESTICIDES IN WATER: RESIDUES IN PONDS TREATED WITH TWO FORMULATIONS OF DICHLOBENIL,
Agricultural Research Service, Prosser, Wash. Irrigated Agriculture Research and Extension Center.
A. G. Ogg, Jr.
Pesticides Monitoring Journal, Vol 5, No 4, p 356-359, March 1972. 2 fig, 5 ref.

Descriptors: *Water pollution sources, Water quality control, *Pesticides, *Ponds, *Testing procedures, On-site investigations, Analytical techniques, Application methods.
Identifiers: Analytical results, Dichlobenil.

Residue levels of dichlobenil in pond water and hydrosoil were compared after field applications of wettable powder and granular formulations to separate ponds at 10.0 lb-surface acre (0.6 ppmw, parts per million by weight, in the water). Water and hydrosoil samples were taken from each pond

1 day after treatment and periodically thereafter. Maximum residue concentrations in the water, reached 4 and 5 days after treatment with wettable powder and granules, respectively, were 1.00 and 0.68 ppmw. After 15 days, the residual concentrations were approximately the same and both decreased steadily to the detection limit of 0.001 ppmw after 126 days (last sampling date). The maximum concentration of dichlobenil in the hydrosoil was 1.472 ppmv (parts per million by volume) 6 days after treatment with wettable powder and 3,700 ppmv 1 day after treatment with the granules. Residues in the hydrosoil of the two ponds did not reach similar levels until 34 days after treatment. The residual concentrations from the wettable powder and granular treatments had decreased to 0.039 and 0.025 ppmv, respectively, 126 days after treatment. The persistence of dichlobenil in pond water and hydrosoil was similar whether applied as granular or wettable powder formulation. (Woodard-USGS)
W72-06773

SUBSURFACE DISPOSAL OF WASTE IN CANADA,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 05E.
W72-06776

PHOSPHATES AND THE CANADA WATER ACT,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
W. J. Traversy, and M. Comba.
Technical Bulletin No 48, September 1971. 13 p, 2 tab, 3 ref, append.

Descriptors: *Water pollution sources, *Phosphates, *Detergents, *Ecology, *Water pollution control, Legislation, Municipal wastes, Industrial wastes, Eutrophication.
Identifiers: *Canada, Laundry detergent.

Analytical data are presented on the content of phosphates in detergents in Canada. Data are included on chemical analyses (particularly for phosphates) of detergents manufactured before and after implementation of the regulations on August 1, 1970. The major source of phosphorus in municipal and industrial wastes discharged to lakes and rivers is the phosphate-based laundry detergent and control of phosphates in cleaning products was considered to be the logical first step in a program of nutrient control. The regulations limit the allowable phosphate concentration in laundry detergents to 20%, expressed as phosphorus pentoxide. (Woodard-USGS)
W72-06777

MERCURY--AN OVERVIEW,
New York State Coll. of Agriculture, Ithaca.
J. F. Dewey, and R. F. Pendleton.
Agrichemical Age, Vol 14, No 4, p 8-11, April 1971.

Descriptors: *Metals, *Mercury, *Water pollution sources, *Pesticides, *Agricultural chemicals, Environmental effects, Toxicity, Natural resources, Soils, Organic soils, Rocks, Surface waters, Spring waters, Groundwater, Mildews, Paints, Inhibitors, Residues.

The basic place that mercury occupies in our environment is described, and facts are given to demonstrate that agriculture has much less to do with mercury pollution than most people realize. Like water, mercury is present nearly everywhere in nature. Only 0.02% of the metal in the earth's crust occurs as high grade ore. The balance is widely distributed in soils and rocks as sulfide. Organic soil may contain as much as 100 ppb (parts per billion) to a depth of 3 ft, or about 1.3 lb of mercury per acre. Inland surface waters usually have less than 0.1 ppb unless near large natural mercury sources or are man polluted. Up to 80 ppb have been measured in spring water. Petroleum with brines may contain several hundred ppb of mercury. Man annually puts into the environment the same amount of mercury as comes from natural sources. Total 1968 consumption of mercury in the United States was 5.7 million lbs. About 17% was used in pesticides of which 66% went into mildew proofing paint, 28% in agriculture, 3% in paper and pulp processing and 3% in other paint products. Use in agriculture pesticides totals about 265,000 lbs. A history is given of use of mercury compounds; toxicity, residues, and misuse are described. (Lang-USGS)
W72-06787

GASOLINE IN GROUNDWATER,
California Inst. of Tech., Pasadena. Dept. of Environmental Engineering.
J. E. McKee, F. B. Laverty, and R. M. Hertel.
Journal Water Pollution Control Federation, Vol 44, No 2, p 293-302, February 1972. 5 fig, 1 tab, 7 ref.

Descriptors: *Water pollution sources, *Path of pollutants, *Gasoline, *Groundwater, *California, Oily water, Water pollution treatment, Biodegradation, Water pollution control.
Identifiers: *Glendale (Calif).

In 1968 up to 30 in. of free gasoline was detected in many acres of irrigation wells in Glendale, California, and posed a threat to the area's groundwater table, which seasonally rises and falls as much as 30 ft. Column tests showed that in falling and rising water tables, gasoline becomes pellicular during the falling stage and does not become free when the table rises. As a result, 44,000 gal of free gasoline out of an estimated 100,000 to 250,000 could be removed by pumping. Pellicular gasoline in the aeration zone above the water table is rapidly utilized as a carbon source by bacteria, and the number of such bacteria present is an indicator of progress of cleanup of spills. (Knapp-USGS)
W72-06810

NITROGEN ECONOMY OF CROPPED AND UNCROPPED FLOODED RICE SOILS UNDER FIELD CONDITIONS,
The International Rice Research Inst., Los Banos, Laguna (Philippines).
For primary bibliographic entry see Field 03F.
W72-06833

APPLIED NITROGEN LOSSES IN RELATION TO OXYGEN STATUS OF SOILS,
Agricultural Research Service, Brawley, Calif. Soil and Water Conservation Research Div.
B. D. Meek, L. B. Grass, and A. J. MacKenzie.
Soil Science Society of America Proceedings, Vol. 23, No. 4, p 575-578, July-August, 1969. 2 fig, 4 tab, 5 ref.

Descriptors: *Nitrates, Nitrogen cycle, *Denitrification, Irrigation, Anaerobic conditions, Groundwater, Oxygen, Soil water, *Oxidation-reduction potential, Cotton, *Soil chemistry, California.
Identifiers: *Soil redox potential, *Imperial Valley (Calif.).

The decrease in soil nitrate nitrogen as related to redox potential was studied in the laboratory and in the field in Imperial Valley, California. Partial anaerobic conditions were induced in laboratory flasks containing an atmosphere of 21% oxygen by adjusting the soil-water ratio. When the water content of a soil having a water saturation percentage of 48% was increased to 44.5% or above, large losses of N2 gas occurred both with and without addition of organic matter. Significant denitrification coincided with a decrease in the redox potential. Measurement of redox potential and nitrate concentrations of ground water sampled at various depths in an irrigated field indicated that nitrate concentration was high near the surface but decreased at depths approaching the water table. The diminishing nitrate concentration and redox potential, with depth, indicate that some nitrates were reduced to nitrogen gas before they reached the water table. Only 1.5% of the 280 kg N/hectare applied to a cotton crop (Gossypium hirsutum L.) was discharged in the tile effluent during the growing season. Denitrification in the soil profile apparently reduced the amount of nitrate reaching the tile drainage system. (Skogerboe-Colorado State)
W72-06835

FERTILIZERS AND AGRICULTURAL CHEMICALS.
National Industrial Pollution Control Council, Washington, D.C. Fertilizer and Agricultural Chemicals Sub-Council.
For primary bibliographic entry see Field 05G.
W72-06860

RELEASE OF MERCURY FROM CONTAMINATED FRESHWATER SEDIMENTS BY THE RUNOFF OF ROAD DEICING SALT,
JBF Scientific Corp., Burlington, Mass.
G. Feick, R. A. Horne, and D. Yeaple.
Science, Vol 175, No 4026, p 1142-1143, March 10, 1972. 1 tab, 4 ref.

Descriptors: *Salts, *Deicers, *Water pollution sources, *Path of pollutants, Sediments, *Roads.
Identifiers: *Mercury.

Addition of NaCl or CaCl2 increases the relative amount of mercury in the water in equilibrium with sediments by two to five or more orders of magnitude. The effect tends to increase as the mercury burden of the sediments increases. In addition to being a serious contaminant itself, road salt in natural waters can acerbate contamination by mercury and undoubtedly by other toxic heavy metals. (Knapp-USGS)
W72-06911

GUIDEBOOK FOR THE 36TH ANNUAL FIELD CONFERENCE OF PENNSYLVANIA GEOLOGISTS.
For primary bibliographic entry see Field 02J.
W72-06926

HYDROLOGY, GLACIAL GEOLOGY AND ENVIRONMENTAL GEOLOGY OF THE WYOMING-LACKAWANNA VALLEY,
Geological Survey, Harrisburg, Pa.
J. R. Hollowell.
In: Proceedings of 36th Annual Field Conference of Pennsylvania Geologists, October 8-9, 1971, Wilkes Barre, p 77-103, 1971.

Descriptors: *Water pollution sources, *Coal mine wastes, *Hydrology, *Pennsylvania, Evaluation, Reviews, Glaciers, Mine acids, Coal mines, Runoff, Seepage, Hydrogeology, Geology, Ecology, Environmental effects, Industrial wastes.
Identifiers: *Wyoming-Lackawanna Valley (Penn).

Environmental problems resulting from the removal of coal from Wyoming-Lackawanna Valley in Pennsylvania are presented. Removing coal from the Wyoming-Lackawanna Valley for over 150 years has marred the region with waste rock dumped on the surface, with deep gashes, and cast piles from stripping and silt banks. Water from surface streams infiltrates underground workings mainly by leakage from streambeds through broken strata overlying the mine openings. Precipitation and overland runoff enter the mines mainly through surface strippings and crevasses along steeply dipping beds where the surface has caved into voids below. The movement of water through individual mine pools is generally, in the sequence of flow, from the highest pools north of Scranton to the lowest pools near Nanticoke. Water movement in mid-Wyoming Valley is controlled by pumping from the Delaware-Pine Ridge mine pools to prevent subsidence in the south

Wilkes Barre-Parsons area. (See also W72-06926) (Woodard-USGS)
W72-06928

IN SITU MEASUREMENT OF RADIATION DOSE IN THE COLUMBIA RIVER,
Environmental Health Service, Rockville, Md.
W. L. Lappenbusch, D. G. Watson, and W. L. Templeton.
Health Phys. 21 (2): 1971. 247-252.
Identifiers: Columbia, Dose, Measurement, Radiation, River.

Through the use of LiF thermoluminescent dosimeters, comparative environmental dose measurements were made in the Columbia River upstream from an atomic reactor effluent discharge site, near the point of discharge and at a location downstream from the effluent outfall. These dose estimates were related to water depth, periphyton biomass, and concentration of radionuclides in the periphyton.--Copyright 1971, Biological Abstracts, Inc.
W72-06936

EXPERIMENTAL DENTAL CARIES IN RATS BY SODIUM FLUORIDE AND MOLYBDENUM IN THE DRINKING WATER,
Aichi-Gakuin Univ. (Japan). School of Dentistry.
Mitsuru Takei, Takeshi Suzuki, Hajime Sugiyama, and Shiro Furukawa.
Aichi-Gakuin J Dent Sci. 6 (3/4): 76-80. 1969.
Identifiers: Caries, Dental, Drinking, Fluoride, Molybdenum, Rats, Sodium.

Weanling albino Sprague-Dawley rats (77) were classified by sex and weight into 5 groups. Group N served as caries inactive control and was fed a normal diet and pure water, and group C served as a caries active control and was fed a cariogenic diet and pure water, ad libitum. Group C-F was fed a cariogenic diet and 25 ppm F. Group C-Mo was fed a cariogenic diet and 25 ppm Mo, and group C-FMo was fed a cariogenic diet and 25 ppm fluoride and 25 ppm Mo, ad libitum. They were sacrificed at 140 days and their caries extent was observed by stereo microscopy. The average percentage of carious teeth were 27% in group N, 100% in group C, 11% in group C-F, 12% in group C-Mo and 0% in group C-FMo. In cut teeth observation, the average percentage of caries decreased to 0% in group N, 75% in group C, and 0% in all other groups. Most caries were observed on bucal or lingual surfaces. No large difference was found between hardness and Ca/P of teeth in each experimental group, and between the abilities to form dentin. The quantity of glucose in the blood was not different, but that of pyruvic acid was high in the groups of a cariogenic diet.--Copyright 1971, Biological Abstracts, Inc.
W72-06948

MODEL RIVERS, AN AID IN DECISION-MAKING,
Texas Univ., Austin.
For primary bibliographic entry see Field 06B.
W72-06971

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. II, COMPUTATION PROCEDURES,
New York City-Rand Inst., N.Y.
J. J. Leendertse, and E. C. Gritton.
R-708-NYC, July, 1971. 53 p, 13 fig, 8 ref.

Descriptors: *Model studies, *Mathematical models, *Water quality, *Estuaries, *Simulation analysis, *Tidal water, Flow, Coasts, Sea water, New York.
Identifiers: *Jamaica Bay, Long Island (NY).

A water-quality model of the Jamaica Bay, Long Island, New York, developed in another paper by the same authors was extended to include the transport of several waste constituents and a reaction model which simulated the biological and chemical interactions among these constituents in coastal waters. The numerical methods used to approximate the system of partial differential equations describing the tidal flow, dispersion and transport of constituents were described in detail. The model simulated the changes in boundaries that occur in shallow areas of estuaries as a result of the changing tide level. Examples are given of the necessary input parameters and resultant output data obtained from the simulation model. (See also W71-04038 and W72-06980) (Ligon-Cornell)
W72-06979

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. III, JAMAICA BAY SIMULATION,
New York City-Rand Inst., N. Y.
For primary bibliographic entry see Field 05G.
W72-06980

SYSTEMS ANALYSIS: SOME CHARACTERISTICS, HISTORY, AND AREAS OF APPLICATION.
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06A.
W72-06985

DATA AND ANALYSIS.
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06A.
W72-06988

PHYSICAL, CHEMICAL, AND BIOLOGICAL ASPECTS OF THE DUWAMISH RIVER ESTUARY, KING COUNTY, WASHINGTON, 1963-67,
Geological Survey, Washington, D.C.
J. F. Santos, and J. D. Stoner.
Available from GPO, Washington, DC 20402-Price $0.40 (paper cover) Stock No 2401-1207. Geological Survey Water-Supply Paper 1873-C, 1972. 74 p, 41 fig, 6 tab, 41 ref.

Descriptors: *Water pollution control, *Estuaries, *Water pollution sources, *Industrial wastes, *Municipal wastes, Analytical techniques, Dye releases, Path of pollutants, Tracking techniques, Streamflow, Runoff, Tidal effects, Water analysis, Dissolved oxygen, Biochemical oxygen demand.
Identifiers: *Duwamish River estuary (Wash).

A study was made (1963-67) to evaluate the changes that take place in an estuary as the loads of raw and partially treated industrial and municipal wastes are replaced by effluent from a secondary treatment plant. The study area was the Duwamish River estuary in King County, Washington, about 18.3 river kilometers long. At mean sea level the estuary has a water-surface area of about 1 square mile and a mean width of 440 feet. At the lowest and highest recorded tides, the volume of the estuary is about 205 and 592 million cubic feet, respectively. The estuary is well stratified (salt-wedge type) at fresh-water inflows greater than 1,000 cfs (cubic feet per second), but when inflow rates are less than 1,000 cfs the lower 5.6 kilometers of the estuary grades into the partly mixed type. Studies using a fluorescent dye show that virtually no downward mixing into the salt wedge occurs; soluble pollutants introduced at the upper end of the estuary stay in the surface layer (5-15 ft thick). When fresh-water inflow is less than 400 cfs, less than 10% of a pollutant will remain in the estuary a minimum of 7 days. Longitudinal dispersion coefficients for the surface layer were on the order of 100-400 square feet per second. (Woodard-USGS)
W72-06998

TEMPERATURE PREDICTION IN STRATIFIED RESERVOIRS,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
W. C. Huber, D. R. F. Harleman, and P. J. Ryan.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 98, HY4 Paper 8839, p 645-666, April 1972. 10 fig, 21 ref, append. EPA Grant 16130 DJH.

Descriptors: *Stratification, *Reservoirs, *Water temperature, *Mathematical models, Reservoir releases, Mixing, Thermal stratification, Water quality, Advection.
Identifiers: Reservoir temperature forecasting.

A differential equation describes the vertical temperature distribution in a stratified reservoir and may be solved numerically. Outlet temperatures are an integration of temperatures from within the withdrawal layer, the thickness of which depends upon the degree of stratification. Comparison of predicted and measured temperatures from the laboratory and field shows that the mathematical model is capable of reproducing measured temperature profiles to within an accuracy of approximately 1 deg C without requiring any parameters that must be determined from prior temperature measurements. A net vertical advection is the primary mechanism by the heat is transported from the surface to the reservoir outlet. (Knapp-USGS)
W72-07009

CHEMICAL QUALITY OF WATER IN THE WALNUT RIVER BASIN, SOUTH-CENTRAL KANSAS,
Geological Survey, Washington, D.C.
R. B. Leonard.
Available from GPO, Washington, DC 20402 Price $3.75 Stock No. 2401-1141. Geological Survey Water-Supply Paper 1982, 1972. 113 p, 24 fig, 3 plate, 9 tab, 45 ref.

Descriptors: *Water quality, *Water pollution sources, *Oil industry, *Industrial wastes, *Kansas, Chemical analysis, Water pollution effects, Water pollution control, Surface waters, Groundwater, River basins, Hydrogeology, Water wells, Streamflow, Data collections, Waste water disposal, Hydrologic data.
Identifiers: *Walnut River basin (Kans).

Improper disposal of oil-field brine and other wastes has adversely affected the chemical quality of much of the water in the Walnut River basin, south-central Kansas. The basin is an area of about 2,000 square miles. Concentrations of dissolved solids and of one or more ions in most well waters exceeded recommended maximums for drinking water. Nearly all the groundwater is hard to very hard. Groundwater containing more than 1,000 mg/liter dissolved solids and more than 100 mg/liter chloride is common near oil fields but is exceptional elsewhere. Sodium and chloride are the principal ionic constituents of oil-field brine but are minor constituents of natural surface waters or shallow groundwater in the basin. The concentration of chloride increased during low flow of the major streams, and the sodium-chloride ratio decreased, in a downstream direction, from about 0.65 near the headwaters to about 0.51. Pollution control markedly reduced the concentrations of chloride at corresponding rates of discharge after 1955. However, concentrations of sodium and chloride were far higher, and sodium-chloride ratios were lower, than those that prevailed before extensive development of the oil fields. (Woodard-USGS)
W72-07025

BOVINE HEPATIC DISTOMATOSIS IN THE LORRAINE REGION. INTRODUCTION TO THE ECOLOGY OF THE INTERMEDIATE HOST OF FASCIOLA HEPATICA, LYMNAEA TRUNCATULA MULLER,
Ecole National Superieure d'Agronomie, Nancy (France. service Entomol.
For primary bibliographic entry see Field 05C.

W72-07038

THE OPTIMAL CONTROL OF POLLUTION,
John F. Kennedy School of Government, Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W72-07112

IRRIGATION RESIDUES,
Robert S. Kerr Water Research Center, Ada, Okla.
J. P. Law, and J. L. Witherow.
Journal of Soil and Water Conservation, Vol. 26, No. 2, p 54-56, 13 ref, March-April 1971. EPA Program 13030--03/71.

Descriptors: *Irrigation effects, *Pollutants, Water quality control, Waste water (Pollution), Pollution abatement, *Farm wastes, Return flow, Water pollution sources.
Identifiers: Salinity control.

The water quality problems associated with irrigation return flow are difficult to control. The major problems are the increased dissolved salt and nutrient content of waters draining from irrigated land. The difficulty in control is due to the diffuse nature of irrigation return flows coming from large irrigated areas and from both surface and subsurface drainage. Insufficient research has been devoted directly to the solution of return flow quality problems. Studies are needed to answer specific questions regarding both quantity and quality of irrigation residues. Possible control measures are discussed, but specific data concerning their effectiveness in abating water quality degradation are lacking. These must be evaluated and suitable management practices implemented to control water quality problems rising from irrigation. (EPA abstract)
W72-07122

CHARACTERISTICS AND EFFECTS OF CATTLE FEEDLOT RUNOFF,
Robert S. Kerr Water Research Center, Ada, Okla.
M. R. Scalf, W. R. Duffer, and R. D. Kreis.
Paper presented at the 25th Annual Purdue Industrial Waste Conference, Lafayette, Indiana, 18 p, 10 fig, 3 tab, May 1970. EPA Program 13030--05/70.

Descriptors: *Farm wastes, *Cattle, *Nutrients, *Organic wastes, *Solid wastes, Reservoir, Biological communities, Dissolved oxygen, Waste water treatment, Runoff, Feed lots, Chemical properties, Physical properties, Reservoir fisheries.
Identifiers: *Manure, Fish kill.

A three-phase research study was conducted at a 12,000 head beef feedlot located near McKinney, Texas. The first phase was to determine the physical and chemical characteristics of the rainfall runoff water from feed pens. The second phase was to determine quality changes as the feedlot runoff traversed the collection and treatment system from the feedpens to a reservoir. The third phase was to evaluate the effects of the effluent from collection pond-ditch-farm pond system on the water quality of a receiving reservoir. Direct runoff was found to contain concentrations of organic matter, solids and nutrients one order of magnitude higher than raw municipal sewage. The treatment system was inadequate. Ammonia and dissolved oxygen concentrations which resulted in the receiving reservoir caused fish kills and extensive changes in the biota of the reservoir. (EPA abstract)
W72-07126

CIRCADIAN MIGRATIONS AND FEEDING RHYTHM OF SOME INDIAN OCEAN EUPHAUSIID SPECIES,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 05C.
W72-07131

SYSTEMS STUDY OF OIL SPILL CLEANUP PROCEDURES. VOLUME I: ANALYSIS OF OIL SPILLS AND CONTROL MATERIALS,
Dillingham Corp., La Jolla, Calif. Applied Oceanography Div.
For primary bibliographic entry see Field 05G.
W72-07133

URANIUM IN RUNOFF FROM THE GULF OF MEXICO DISTRIBUTIVE PROVINCE: ANOMALOUS CONCENTRATIONS,
Texas A and M Univ., College Station. Dept. of Oceanography.
R. F. Spalding, and W. M. Sackett.
Science, Vol. 175, No. 4022, p 629-631, February 11, 1972. 2 fig, 1 tab, 9 ref.

Descriptors: *Water pollution sources, *Fertilizers, *Phosphates, *Surface runoff, Uranium radioisotopes, Water analysis, Absorption, Crops, Heavy metals, Nitrogen, Potassium, Agricultural watersheds, Water pollution, Rivers, Toxicity, Neutron activation analysis, Rio Grande, Gulf of Mexico, Alfalfa, Corn (Field), Soybeans, Cereal crops, Path of pollutants, Colorado River, Mississippi River.
Identifiers: *Uranium, Radioactive decay, Uranium-238, Radium-226, Lead-210, Polonium-210, Sabine River, Neches River, Trinity River, Brazos River, Guadalupe River, San Antonio River, Atascosa River, Frio River, Nueces River, Rio Candelaria, Rio Grijalva, Rio Tonala, Rio coatzacoalcos.

That uranium concentrations in North American rivers are higher than 20 years ago is attributed to increased agricultural use of phosphate fertilizers with high uranium concentration. Experiments have been designed to determine the chemical behavior of uranium during fertilizer production and weathering of fertilized soil and to evaluate the pollution potential of uranium. Uranium concentrations for 22 samples from 15 different rivers flowing into the Gulf of Mexico were determined by a delayed neutron technique and tabulated. Those rivers flowing through uranium-bearing strata and highly agricultural regions show the highest concentrations of the metal. Experiments on 27 commercial fertilizer samples (0-46 percent of P205, varying concentrations of N and K) show (1) a linear relationship of uranium to the percentage of P205 and (2) extremely high concentrations of uranium in the triple superphosphates (0-46-0). Analysis of different fertilizer processing steps showed a step-by-step increase of uranium per increased percentage of P205. When a small plot of land treated with 10-20-10 commercial fertilizer had an equivalent of 0.5 inch of rain applied, uranium in the runoff was 28 times that in a similar blank application. Little uranium uptake was found to occur in alfalfa, corn, and soybeans; however, the absorption radioactive decay products of uranium by plants make it a potential environmental hazard. (Snyder-Battelle)
W72-07135

THE DISPERSION OF MATTER IN TURBULENT PIPE FLOWS,
Colorado State Univ., Fort Collins.
K. M. Atesmen, L. V. Baldwin, and R. D. Haberstroh.
ASME Journal of Basic Engineering, Vol. 93, No. 4, p 461-477, December 1971. 24 fig, 29 ref.

Descriptors: *Flow control, *Dispersion, *Mathematical studies, Water pollution control, Streamflow, Pipes, Measurement, Instrumentation, Equations, Unsteady flow, Diffusion, Transition flow, Laminar flow, Digital computers, Computer programs, Methodology.
Identifiers: Metering, Calculations, Aris moment transformations.

The prediction of the dispersion of matter in turbulent shear flows is of practical interest to flow metering in pipes and natural streams and in pollution control studies. The transient diffusion equation with an eddy diffusivity approximation is applicable to this problem. The moment method of Aris, which is well suited to computer methods, is used to solve the mass conservation equation for dispersion near the injection source. The governing equations are converted to a tractable system of equations which is solved mainly by numerical methods with the aid of a digital computer, for the zeroth, first, second, third, and fourth moment of the longitudinal concentration distribution. The utility of the moment method is enhanced by use of Hermite polynomials to express the longitudinal concentration distributions. The results agree with the asymptotic predictions of Taylor for long dispersion times. The computational convenience of the suggested solution is demonstrated for specific examples where experimental data are available. (Mortland-Battelle)
W72-07138

WINTERTIME DISSIPATION OF HEAT FROM A THERMALLY POLLUTED RIVER,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. F. Weeks, C. M. Keeler, W. Parrott, and D. Levine.
Water Resources Research, Vol. 7, No. 6, p 1529-1537, December 1971. 7 fig, 2 tab, 11 ref.

Descriptors: *Test procedures, *Water temperature, *Water quality, *Thermal pollution, *Heat balance, Measurement, Thermal water,. Electric powerplants, Wyoming, Cooling water, Profiles, Meteorological data, Climatic data, Flow measurement, Sampling, Thermometers, Mathematical models, Thermocline, Analytical techniques.
Identifiers: *North Platte River, Whitney thermometer.

To test a method for predicting water temperature downstream from a thermal pollution source, field data collected from the North Platte River below the Dave Johnson power plant at Glenrock, Wyoming were compared with predicted values. A Whitney underwater thermometer was used to determine temperaure profiles across the river at five cross sections located at varying distances below the powerplant. Water temperature upstream from the power plant was held constant at O degree C by a full ice cover. Air temperature, wind speed, wind direction and net radiation values were also determined at two sites. Evaporative and convective heat losses were determined by the Bowen ratio, which is the ratio of the convective to evaporative heat exchange. This ratio was combined with three equations: The Kohler equation, the Rimsha and Donchenko equation and the Dingman et al equation. Very satisfactory agreement between observed and calculated values was achieved when relations suggested by Rimsha and Donchenko were used to estimate the evaporative and convective heat losses. Other relations either gave a larger scatter or systematically underestimated the actual cooling. (Jefferis-Battelle)
W72-07139

ION TRANSPORT STUDIES ON PHYTOPLANKTON OF A FISH POND AT ILE--IFE,
Ife Univ. (Nigeria). Dept. of Biological Sciences.
A. M. A. Imevbore, and Z. Boszormenyi.
Archiv fur Hydrobiologie, Vol. 69, No. 2, p 200-209, October 1971. 4 fig, 3 tab, 41 ref.

Descriptors: *Phytoplankton, *Ion transport, *Absorption, *Phosphorus, *Phosphorus radioisotopes, Algae, Fresh water, Filtration, Leaching, Fungi, Light, Phosphates, Nutrients, Water pollution effects, Radioactivity techniques.
Identifiers: Cyanides, Phosphorus-32.

The ion transport of phosphorus by phytoplankton was investigated by exposing microorganisms to water samples from a fishpond at Ile-Ife (Nigeria) which were labeled with phosphorus-32. The analyses were restricted to the processes acting between the phytoplankton and the external inor-

ganic phosphate pool. The studies produced data on the rate of uptake, effect of phosphorus concentration on uptake, effect of washing with inactive phosphorus, and the effects of light, cyanide, and shaking on uptake. The qualitative and quantitative dissimilarity between the absorption at the high (1mM) and the low (0.01mM) phosphorus-32 concentrations seem to exclude the possibility that the absorption processes acting in both ranges are the same. Therefore there are more likely two different mechanisms in ion transport. At the low phosphorus-32 concentrations, cyanide was able to block the phosphate uptake almost completely; at the high phosphorus-32 concentration there was little or no inhibition. The observed uptake at the low concentration was in accordance with the general view that phosphate absorption was dependent upon metabolism and that it was a biological transport process. On the other hand, it was probable that the action of cyanide at high phosphorus-32 concentration depended upon the damage it caused to the structure of biological membranes. Then the increase in uptake must be due entirely to a physical permeation process. Contrary to expectation, shaking tended to reduce the absorption rate. (Holoman-Battelle)
W72-07143

INVESTIGATION OF COMPLEXES OF LANTHANUM AND LUTETIUM WITH NITRILOTRIACETATE BY NUCLEAR MAGNETIC RESONANCE,
For primary bibliographic entry see Field 05A.
W72-07156

KINETIC DETERMINATION OF ORTHOPHOSPHATE IN THE PRESENCE OF CONDENSED PHOSPHATES,
Akademiya Nauk URSR, Kiev. Instytut Fizychoi Khimii.
For primary bibliographic entry see Field 05A.
W72-07157

EFFECT OF ADVECTION AND BIOCHEMICAL PROCESSES ON THE VERTICAL DISTRIBUTION OF PHOSPHORUS IN THE TROPICAL OCEAN,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
V. V. Sapozhnikov.
Okeanologiya, Vol 11, No 2, p 183-188, 1971. 2 fig, 2 tab, 9 ref.

Descriptors: *Sea water, *Phosphorus, *Distribution patterns, Water temperature, Salinity, Phosphates, Oxygen, Nutrients, Advection, Pacific Ocean, Biochemistry, Suspended load, Organic matter, Oxidation, Water analysis.
Identifiers: Organophosphorus compounds.

Total phosphorus is calculated and its genetic components are estimated for samples obtained from several stations in the tropical Pacific. The calculations are based on data on the vertical distribution of the temperature, salinity, oxygen, phosphates, and total phosphorus. Using the linear relationship between the amount of oxygen expended on the oxidation of organic matter and the value of regenerated phosphates, the quantity of oxidizing phosphates is computed from the oxygen deficiency. The difference between the total phosphates and oxidizing phosphates is the amount of preformed phosphates. The difference between total and inorganic phosphorus is the sum of the dissolved and suspended organic phosphorus. The percentage of each constituent of the phosphorus balance is calculated vertically and the general patterns of the vertical distribution of all the constituents contributing to the phosphorus concentration are examined. The relative significance of advection and the biochemical processes in the vertical distribution of phosphorus in the tropical Pacific is elucidated. (Mortland-Battelle)
W72-07169

2, 5-DI- (BENZOXAZOLE-2-YL)THIOPHENE, AN OPTICAL BRIGHTENER CONTAMINATING SLUDGE AND FISH,
Lantbrukhogskolan, Uppsala (Sweden). Dept. of Chemistry.
S. Jensen, and O. Pettersson.
Environmental Pollution, Vol. 2, p 145-155. 1 fig, 5 tab, 2 ref.

Descriptors: *Indicators, *Tracers, *Absorption, Path of pollutants, Pollutant identification, Stability, Water pollution effects, Bioassay, Bleaching wastes, Detergents, Sewage effluents, Textiles, Waste identification, Municipal wastes, Waste water treatment, Industrial wastes, Textiles.
Identifiers: *DBT, Textile industry, Thiophene, Concentration coefficients.

Digested sludge from sewage treatment plants was used in an attempt to find a medium for unprejudiced detection of environmental pollutants. Sludge from a town with textile mills contained up to 40 mg/l (dry weight) of 2-,5-di (benzoxazole-2-yl)thiophene (DBT). DBT is also an optical brightener used to some extent in detergents in Sweden. Fish downstream from the plant contained up to 2 mg/l of DBT in their livers. In digestion experiments (both aerobic and anaerobic), 33% of added DBT was recovered after 40 days. An accumulation coefficient greater than 1000 occurred between water and body fat of goldfish in aquarium experiments. After 32 days, 80% still remained unconverted in the aquarium. No detectable amount of DBT was found in the fish after three days in pure water. The identification and the quantitative analysis of DBT is described. DBT possesses a low toxicity, but its accumulation in nature has not been considered until now. (LeGore-Washington)
W72-07222

INVESTIGATIONS CONCERNING PROBABLE IMPACT OF NITRILOTRIACETIC ACID ON GROUND WATER,
Robert S. Kerr Water Research Center, Ada, Okla.
W. J. Dunlap, R. L. Cosby, J. F. McNabb, B. E. Bledsoe, and M. R. Scalf.
Copy available from GPO Sup Doc EP2.10:16060 GHR--11/71, $0.60; microfiche from NTIS as PB-208 433, $0.95. Environmental Protection Agency Water Pollution Control Research Series, November 1971. 51 p, 19 fig, 3 tab, 9 ref. EPA Program 16060 GHR--11/71.

Descriptors: *Nitrilotriacetic acid, *Path of pollutants, *Water pollution effects, *Groundwater, Detergents, Surfactants, Water pollution sources, Water pollution, Biodegradation, Adsorption.
Identifiers: *Groundwater pollution.

The fate and effect of NTA both in ground waters and in soil profiles overlying ground waters were studied using laboratory models. Sorption of NTA on soils slows its movement into and through ground waters. Sorption is not sufficient to prevent or greatly reduce potential pollution of ground water by NTA used as a detergent builder. NTA infiltrating through most unsaturated soils undergoes rapid and complete degradation and contributes only inorganic nitrogen compounds and carbonate to ground waters. NTA infiltrating through saturated soils experiences only very limited degradation, with a major portion entering ground water intact. Any NTA which escaped degradation during infiltration through soils could transport such metals as iron, zinc, chromium, lead, cadmium, and mercury from soils into ground waters. NTA would degrade slowly in essentially anaerobic ground-water environments, with production of CO2, CH4, and possibly other organic compounds. (Knapp-USGS)
W72-07223

TIDAL EXCHANGE AT GOLDEN GATE,
Brown and Caldwell, Inc., San Francisco, Calif.
D. S. Parker, D. P. Norris, and A. W. Nelson.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA2, Paper 8810, p 305-323, April 1972. 9 fig, 7 tab, 7 ref, append.

Descriptors: *Tides, *Currents (Water), *Water circulation, *Inlets (Waterways), *Bays, California, Estuaries, Path of pollutants, Tracers, Water quality, Tidal waters.
Identifiers: *Golden Gate (Calif), *San Francisco Bay.

Tidal exchange can be a powerful mechanism for flushing pollutants from bays and estuaries. Tidal exchange is defined by a ratio describing the portion of the flooding tide which is ocean water entering the bay for the first time. At the mouth of the Golden Gate, exchange can be derived from measurements of a naturally occurring tracer, chloride. Field measurements of the tracer were made on two occasions for an ebb tide and a following flood tide, and for background ocean conditions. An exact description of flow through the ocean-bay interface is not required. Tidal exchange during the dry weather period of low fresh water inflow to the estuary was found to correlate with flood-tide range and to average 24%. (Knapp-USGS)
W72-07227

METHODS FOR ANALYSIS OF ORGANIC SUBSTANCES IN WATER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05A.
W72-07230

CARBON AND OXYGEN ISOTOPE EXCHANGE BETWEEN HCO3 IN SALINE SOLUTION AND SOLID CACO3,
Bundesanstalt fur Bodenforschung, Hanover (West Germany).
For primary bibliographic entry see Field 02K.
W72-07231

EVALUATION OF WASTE TREATMENT SYSTEM: CHEMAWA INDIAN SCHOOL,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05D.
W72-07247

EVALUATION OF EXTENDED AERATION TREATMENT AT RECREATION AREAS, PROGRESS REPORT,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05D.
W72-07248

BASIC WASTE CHARACTERISTICS AT WINTER RECREATION AREAS, PROGRESS REPORT,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05D.
W72-07249

INPUT AND OUTPUT OF MINERALS FOR A SMALL WATERCRESS BED FED BY CHALK WATER,
Freshwater Biological Association, Wareham (England). River Lab.
For primary bibliographic entry see Field 02K.
W72-07258

5C. Effects of Pollution

EPIDEMIC OF MERCURY POISONING IN THE AGANO RIVER AREA: AN INTRODUCTORY REVIEW,
Keio Univ., Tokyo (Japan). School of Medicine.
K Tsuchiya.
Keio J Med. 18 (4): 213-227. 1969. Illus. Maps.

Identifiers: Agano, Epidemic, Fish, Introductory, Japan, Mercury, Pesticide, Poisoning, Review, River.

Fish were contaminated by inorganic mercury and by methyl mercury, but it was not clear how and when the river was polluted. The source of mercury was either industry or pesticides.--Copyright 1971, Biological Abstracts, Inc.
W72-06580

THERMOELECTRIC GENERATORS POWERED BY THERMAL WASTE FROM ELECTRIC POWER PLANTS,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 08C.
W72-06586

NORRIS RESERVOIR FERTILIZER STUDY: I. EFFECTS OF FERTILIZER ON FOOD CHAIN ORGANISMS AND FISH PRODUCTION,
Tennessee Valley Authority, Norris.
Carl E. Wood, and Tommy L. Sheddan.
J Tenn Acad Sci. 46 (3): 81-90. 1971. Illus. Map.
Identifiers: Chain, Fertilizer, Fish, Food, Game, Norris, Organisms, Production, Reservoir, Species, Tennessee.

The ability of inorganic fertilizer to increase production and survival of fish food organisms and game fish, thereby increasing sporting fish, in localized cove areas of Norris Reservoir, Tennessee, was studied from April to Oct. 1967. Increasing fishing and nutrients in localized areas of a reservoir in 1 growing season by fertilization does not appear practical. Fertilization increased the numbers of bottom organisms and zooplankton, but there was no significant change in numbers, size, species, composition, or survival of fish. Temperature and O2 profiles, coupled with the physical characteristics (directional axis of coves in relation to main creek and cove depth and length) suggest that the age of the water may be very significant in increasing production in coves. (See also W72-06600)--Copyright 1971, Biological Abstracts, Inc.
W72-06599

NORRIS RESERVOIR FERTILIZER STUDY: II. EFFECTS OF THERMAL STRATIFICATION AND NUTRIENT AVAILABILITY ON THE PRODUCTIVITY OF RESERVOIR PHYTOPLANKTON,
Tennessee Valley Authority, Muscle Shoals, Ala.
Mahlon P. Taylor, and Eugene B. Welch.
J Tenn Acad Sci. 46 (3): 90-98. 1971. Illus.
Identifiers: Availability, Fertilizer, Norris, Nutrient, Phyto, Plankton, Productivity, Reservoir, Stratification, Tennessee, Thermal.

Phytoplankton productivity was determined biweekly in 6 coves of Norris Reservoir, during April to Oct. 1967, to study the relation between phytoplankton productivity and certain physical and chemical factors. Fertilizer was distributed to 4 of the 6 coves between biweekly sampling dates. Productivity declined during May and June and remained low in all coves until Sept. This decline was directly related to the onset of thermal stratification and reduction of the P content to less than detectable levels in the epilimnion. N gradually declined, but levels did not fall below about 0.2 mg/l. An outburst in productivity occurred in Sept. after P in the epilimnion had increased. Productivity was greater in fertilized than control coves, but the differences were not statistically significant. (See also W72-06599)--Copyright 1971, Biological Abstracts, Inc.
W72-06600

ENVIRONMENTAL PHYSIOLOGY OF FRESH WATER PLANKTONIC CRUSTACEA,
Kansas Water Resources Research Inst., Manhattan.
K. B. Armitage.
Available from the National Technical Information Service as PB-208 023, $3.00 in paper copy, $0.95 in microfiche. Project Completion Report Contribution No. 95, March 1972. 20 p, 3 fig, 3 tab, 21 ref. OWRR A-027-KAN (1).

Descriptors: *Metabolism, *Daphnia, *Temperature, Growth rates, Reproduction, *Crustaceans, *Thermal pollution, *Plankton, Environmental effects, Water pollution effects, Energy budget.
Identifiers: Acclimation, D. ambigua, D. galeata mendotae.

The addition of heated effluents to fresh water environments could affect ecosystem energetics by its effects on metabolism. The poikilothermic planktonic crustaceans presumably have a temperature-dependent metabolism. However, metabolic compensation could markedly modify the metabolism-temperature (M-T) curve and hence, the energy budgets of fresh water ecosystems. Four species of Daphnia were cultured at 10 degrees C and 20 degrees C. Their metabolism was measured at 10 - 12 degrees C and 20 - 22 degrees C. D. pulex, D. similis, D. ambigua, and D. galeata mendotae showed some degree of metabolic compensation. Those animals acclimated at 10 - 12 degrees C had higher metabolic rates at 10 - 12 degrees C than animals acclimated at 20 - 22 degrees C. In most instances, metabolism at 20 - 22 degrees C was higher in the daphnids acclimated at 10 - 12 degrees C. R-T curves were determined for D. ambigua and D. galeata mendotae at five degree intervals from 5 degrees C to 30 degrees C. The curve of D. ambigua acclimated at 10 degrees C clearly was shifted to the left (translation) of the curve for 20 degrees C acclimation. D. galeata mendotae showed little acclimation over the temperature range of 10 - 20 degrees C. Possibly a combination of rotation and translation occurred. D. galeata mendotae were grown from neonates at 10 degrees C and 20 degrees C. There was no difference in the size of the animals at which eggs first appeared, but animals at 20 degrees C began reproduction several days earlier and produced more young than animals at 10 degrees C. There was some evidence that the temperature at which eggs developed influenced subsequent growth and reproduction.
W72-06603

FACTORS REGULATING THE GROWTH OF ALGAE IN CONTINUOUS CULTURE IN DILUTED SECONDARY SEWAGE TREATMENT PLANT EFFLUENT AND SUBSEQUENT BIODEGRADABILITY,
Kentucky Water Resources Inst., Lexington.
Edward G. Foree, and Caroline P. Wade.
Available from the National Technical Information Service as PB-208 030, $3.00 in paper copy, $0.95 in microfiche. Research Report Number 45, January 1972, 56 p, 10 fig, 5 tab, 29 ref. OWRR A-023-KY (1).

Descriptors: *Algae, *Nitrogen, Hydrogen ion concentration, Biochemical oxygen demand, *Sewage effluents, *Sewage treatment, Culture, *Waste-water treatment, *Carbon dioxide, *Growth rates, *Aerobic conditions, *Growth stages, *Biodegradation, *Biochemical oxygen demand, Chemical oxygen demand.
Identifiers: *Algae growth, *Chemostats.

Heterogeneous algal cultures were grown in laboratory continuous culture in continuous flow, completely mixed chemostats in secondary sewage treatment plant effluent diluted to give an ammonia nitrogen concentration of 10 mg/l. Variables were lighting, pH, carbon dioxide availability, and hydraulic residence time. Optimum growth occurred under pH 7.0, excess CO2, and continuous lighting conditions. The availability of artificially supplied excess CO2 greatly increased the mass (standing crop) at steady-state over that produced under otherwise identical conditions for all residence times studied. For the case of excess CO2 availability, the nitrogen concentration in the algal cells regulated growth rather than the concentration of nutrients in solution. A mathematical expression was hypothesized to describe this phenomenon and was confirmed by the experimental results. Under dark-aerobic conditions, the algal cultures exerted a two-stage BOD, the second stage apparently beginning after the death of the algal cells. Longer chemostat residence times during growth produced cultures with lower percentage biodegradability. Carbon dioxide enriched growth conditions produced cultures with lower percentage biodegradability than cultures grown in a carbon dioxide deficient medium.
W72-06612

POTENTIAL ENVIRONMENTAL EFFECTS OF AN OFFSHORE SUBMERGED NUCLEAR POWER PLANT, VOLUME I.
General Dynamics Corp., Groton, Conn. Electric Boat Div.

Available from the National Technical Information Service as PB-208 281, $0.95 in microfiche. Environmental Protection Agency-Water Quality Office, Water Pollution Control Research Series, June 1971, 327 p, 40 fig, 29 tab, 14 ref. EPA Program 16130 GFI 06/71.

Descriptors: *Thermal pollution, *Nuclear power plants, *Environmental effects, Maine, California, Florida, New York, Water pollution effects, *Radioisotopes, Cooling water.
Identifiers: *Offshore power plants.

Potential environmental effects of wastes from an 1190-Mwe pressurized-water nuclear power plant, submerged 250-ft deep at four representative sites off the U.S. mainland, were studied. The thermal field of the plant's cooling water discharge, and the distribution of radionuclides in the sea, were analyzed. In every case, the thermal 'mixing zone' (by the most stringent present standards) was found to end before either a surface or subsurface field was established, and to be much smaller than for a plant in shallower waters. Fewer organisms would be killed by entrainment in the cooling water than at a coastal plant. A 'batch' release of radionuclides, after the hypothetical nuclear accident, would harm life, requiring suspension, of local fishing for about 10 weeks. No potential ecological damage was predictable from the ordinary minute release of radionuclides, the thermal discharge, or other wastes. Volume I presents the rationale analyses and results of the complete study. (See also W72-06615)
W72-06614

POTENTIAL ENVIRONMENTAL EFFECTS OF AN OFFSHORE SUBMERGED NUCLEAR POWER PLANT, VOLUME II.
General Dynamics Corp., Groton, Conn. Electric Boat Div.

Available from the National Technical Information Service as PB-208 282, $0.95 in microfiche. Environmental Protection Agency-Water Quality Office, Water Pollution Control Research Series, June, 1971, 303 p, 114 fig, 98 tab, 6 ref. EPA Program 16130 GFI 06/71.

Descriptors: *Thermal pollution, *Nuclear power plants, Environmental effects, Maine, California, Florida, New York, Data collections, Water pollution effects, *Radioisotopes, Cooling water.
Identifiers: *New York Bight, *Gulf of Maine, *Miami (Fla), *San Onofre (Calif).

Volume 2 is a descriptive treatise and collation of data on the representative offshore sites, which forms the basis for application of the analytical models to those sites, and for the assessment of the effects of power plant wastes on the marine biota. (See also W72-06614)
W72-06615

MICROBIOLOGICAL STUDIES OF OXYGEN DEPLETION IN THE LAKE ERIE CENTRAL BASIN,
Department of National Health and Welfare, Kingston (Ontario). Div. of Public Health Engineering.
A. S. Menon, and A. A. Jurkovic.
Manuscript Report KR 70-4, 1970. 51 p, 15 fig, 13 tab, 18 refs.

Descriptors: *Aquatic bacteria, *Sulfur bacteria, *Oxygen, *Sediment-water interfaces, *Lake Erie, Hypolimnion, Aquatic algae.

The significance of bacterial activity in the over-all processes of oxygen depletion and nutrient regeneration in the central basin of Lake Erie was assessed. Most intensive bacterial activity occurred at the sediment-water interface. Bacterial decomposition of organic matter accumulating at the interface resulted in the formation of reduced products of low molecular weight and depletion of oxygen in the hypolimnion. These compounds were subsequently oxidized by chemoautotrophic bacteria with further loss of O2. Reducing conditions on the bottom adversely affected nitrifying bacterial densities. However, actively photosynthesizing algae freshly deposited on the bottom stimulated multiplication of nitrifying bacteria and nitrification. Large bacterial populations were absent in the thermocline, suggesting that this zone was not a site for intensive bacterial activity. Quantitative analysis indicated that the high bacterial densities in the hypolimnion, especially at the sediment-water interface, respiring at the rate of 2.4 x 10-11 mg O2 per cell per hour could account for oxygen depletion in the lake. (CCIW)
W72-06690

THE ALGAL FLORA OF THE INLAND WATERS AROUND TASHKENT,
S. Tadzhibaev.
Nauchn Tr Tashk Univ. 378. 175-181. 1970.
Identifiers: Algae, Algal, Blue-Green, Diatoms, Diversity, Flora, Green, Inland, Seasonality, Tashkent, USSR.

The algae of 6 lakes, 5 ponds, and many irrigation ditches were studied. The material, collected weekly for a year, included 435 taxa of algae, among which the greatest variety was shown by the diatoms (159 spp.), the green algae (123 spp.) and the blue-green algae (111 spp.). Data are given on frequency and the cold-loving taxa which develop during winter. Descriptions are given of the seasonal changes in the species composition; these are given separately for running-water (canals and irrigation ditches) and still water (lakes and storage ponds). Algal diversity was greater in drainage and sewage than in running water.--Copyright 1971, Biological Abstracts, Inc.
W72-06739

PHYTOPLANKTON INGESTION BY THE FINGERNAIL CLAM, SPHAERIUM TRANSVERSUM (SAY), IN POOL 19, MISSISSIPPI RIVER,
Jackson State Coll., Miss. Dept. of Biology.
William F. Gale, and Rex L. Lowe.
Ecology. 52 (3): 506-513. 1971. Illus.
Identifiers: Clam, Diatoms, Fingernail, Ingestion, Mississippi, Phyto, Plankton, Pool, River, Seasonal, Sphaerium-Transversum, Stephanodiscus-Hantzschii.

In Pool 19 of the Mississippi River, S. transversum, appears to feed non-selectively on phytoplankton, although green algae were in higher percentages in guts than in plankton samples. Diatoms were of paramount importance in clam guts and water samples during most sampling periods, especially from Dec. to April when mean monthly water temperatures were less than 4 deg C. Ingestion by clams was heaviest in spring, early summer, and fall. Clams appeared to stop ingesting when water temperatures fell to about 2-4 deg C. In Feb. and March, 80-90% of the clams had ceased ingesting. Ingestion did not cease simultaneously in all clams. Throughout the year some contained little or no phytoplankton. Much of the phytoplankton in the gut near the anus appeared completely undigested. Phytoplankton diversity in clam guts and in water samples was high in July and Aug. and low in Feb. and March. A maximum of 33 phytoplankton genera occurred in clams in Aug.; 38 genera were present in water samples in July and Aug. Concentrations of over 50,000 plankters/ml (primarily Stephanodiscus hantzschii) occurred in March 1968; minimum concentrations occurred in July.--Copyright 1971, Biological Abstracts, Inc.
W72-06757

PREDATION OF SCHISTOSOMIASIS VECTOR SNAILS BY OSTRACODA (CRUSTACEA),
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05F.
W72-06765

PLASTICS ON THE SARGASSO SEA SURFACE,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W72-06766

NEW DIRECTIONS IN MODERN LIMNOLOGY, (NOVYYE NAPRAVLENIYA V SOVREMENNOY LIMNOLOGII),
I. M. Raspopov, and N. P. Smirnova.
Vestnik Akademii Nauk SSSR, No 12, p 53-57, December 1971.

Descriptors: *Conferences, *Limnology, *Lakes, *Ecosystems, *Eutrophication, Environment, Biology, Biomass, Fish management, Productivity, Energy budget, Paleolimnology, Self-purification, Model studies, Statistical models, Systems analysis.
Identifiers: *USSR, International Association of Theoretical and Applied Limnology.

The Eighteenth Congress of the International Association of Theoretical and Applied Limnology (IAL) was held in Leningrad, August 19-26, 1971, to study the interaction of physical, geological, geographical, and biological processes occurring in inland waters, as well as those resulting from man's activities. Over 800 delegates attended, representing 35 countries including the United States. Approximately 300 papers were presented at the Congress, including more than 70 reports by Soviet scientists. Investigations of limnological problems were developed in two basic directions: (1) geographical, which examines water bodies as components of the landscape in various geographical zones; and (2) biological, which is concerned with the organic-matter cycle and energy flow in inland waters, water self-purification, and biological production at all trophic levels. Besides problems of general and regional limnology, attention was given to (1) modeling of lake ecosystems; (2) anthropogenic eutrophication of lakes and the role of various sources as contributors of nutrients, including industries, agricultural lands, and municipalities; and (3) studies to improve understanding of the mechanisms of eutrophication and to formulate feasible management procedures. (Josefson-USGS)
W72-06803

BIBLIOGRAPHY OF SOVIET PUBLICATIONS ON FRESHWATER HYDROBIOLOGY AND RELATED QUESTIONS IN 1969.

Hydrobiological Journal, Vol 5, No 6A, p 78-82, 1969. (Originally published in Gidrobiologicheskiy zhurnal, Vol 5, No 5, 1969, p 139-142).

Descriptors: *Bibliographies, *Publications, Translations.
Identifiers: *USSR, *Hydrobiology.

References to 92 Soviet papers published in 1969 on freshwater hydrobiology and related topics are arranged under the following subject headings: (1) freshwater hydrobiology; (2) sanitary hydrobiology; (3) physiology of algae; (4) invertebrate physiology; (5) aquatic microbiology; (6) hydrochemistry of surface waters; and (7) parasitology of freshwater invertebrates. (See also W72-06809) (Josefson-USGS)
W72-06808

A BIBLIOGRAPHY OF SOVIET PUBLICATIONS ON FRESHWATER HYDROBIOLOGY AND RELATED QUESTIONS IN 1969 (PART 2).

Hydrobiological Journal, Vol 5, No 6A, p 8-14, 1969. (Originally published in Gidrobiologicheskiy Zhurnal, Vol 5, No 6, 1970, p 130-134).

Descriptors: *Bibliographies, *Publications, Translations.
Identifiers: *USSR, *Hydrobiology.

Part 2 of the list of Soviet papers published in 1969 on freshwater hydrobiology and related topics contains 103 references arranged under the following subjects: (1) freshwater hydrobiology; (2) sanitary hydrobiology; (3) toxicology of water; (4) physiology of algae; (5) physiology of invertebrates; (6) aquatic microbiology; (7) hydrochemistry of surface waters; and (8) invertebrate parasitology. (See also W72-06808) (Josefson-USGS)
W72-06809

VARIATIONS IN THE THERMIC AND OXYGEN REGIME OF LAKE SEVAN AND THEIR EFFECT ON SOME BIOLOGICAL PROCESSES,
A. G. Markosyan.
Biol Zh Arm. 23 (11): 104-111. 1970. Illus.
Identifiers: Anabaena, Biological, Lake, Management, Oxygen, Pollution, Processes, Regime, Sevan, Thermic, Trout, USSR, Variations, Whitefish.

After lowering the water level of Lake Sevan by 17 m the depth of the thermocline decreased and its area as well as the amount of cold water under it diminished. This resulted in increased temperature of deep water layers. O2 regime was also altered: A SHARP DECREASE IN O2 concentration caused an O2 deficiency which is still in progress. The lake has thus been changed from the deep-reservoir, O2-rich type to the medium-depth, well heated, low O2 type. Biological effects include an increased growth of Anabaena and a decrease in the number of trout due to the deterioration of the living conditions. The number of whitefish increased. Proposed counter-measures include raising the water level of the lake by 5 - 7 m and stopping water pollution from surrounding industry.--Copyright 1971, Biological Abstracts, Inc.
W72-06818

EFFECT OF VARIOUS BEDDINGS ON THE QUALITY OF FARMYARD MANURE: I. FARMYARD MANURE FROM EARTH LITTER,
Cairo Univ. (Egypt). Faculty of Agriculture.
Y. Abd-El-Malek, M. Monib, and A. A. M. Makawi.
UAR J Soil Sci. 9 (1): 1-12. 1969. Illus. (Arabic summ).
Identifiers: Aerobic, Azotobacter, Bacteria, Beddings, Chemical, Clostridium, Earth, Farmyard, Fertilizer, Fixers, Litter, Manure, Microbiological, Nitrate, Nitrifiers, Nitrogen, Proteolytic, Reducers, Soil.

Microbiological and chemical changes in farmyard manure from shirb (irrigation canal clearings) bedding were studied in 2 experimental heaps. The temperature of the heaps increased during the first wk and then declined. While there was continual decrease in the C content, no appreciable changes in N and humus content were recorded. The 5-mo. storage period was not sufficient to bring an appreciable increase in mineral N. Aerobic bacteria, Azotobacter, nitrifiers and nitrate reducers, con-

tinuously decreased. N-fixing clostridia and proteolytic bacteria increased during the early stages of holding. Sebakh baladi a slow release fertilizer appears to suffer marked losses in N.--Copyright 1971, Biological Abstracts, Inc.
W72-06826

EFFECTS OF DETERGENTS ON WATER SUPPLIES,
Ontario Water Resources Commission, Toronto.
A. J. Harris, K. J. Roberts, and A. E. Christie.
Journal American Water Works Association, Vol. 63, No. 12, p 795-799, December 1971. 2 tab, 56 ref.

Descriptors: *Detergents, *Phosphates, *Potable water, Eutrophication, Alkylbenzene sulfonates, Surfactants, Linear alkylate sulfonates, Sewage, Nutrients, Coagulation, Sedimentation, Toxicity, Taste, Odor, Corrosion, Enzymes, Chleation, Algae, Water quality, Biodegradation, Sewage treatment plants, Diatoms, Phytoplankton, Hydorgen ion temperature, Water pollution effects.
Identifiers: Arsenic, Nitrilotriacetate, Polysilicates, Polycarboxylates.

The development of detergents and their direct and indirect effects on water supplies are reviewed. The majority of present-day problems are associated with phosphates in the detergents. These problems include eutrophication of lakes, water quality and treatment problems, and undesirable tastes and odors associated with algal growth. Several materials such as polysilicates, polycarboxylates, NTA, and starch derivatives have been studied as possible replacements for phosphate. Lack of biodegradability, undesirable chelating properties, and corrosion problems are some of the faults that have been detected in these materials. NTA has been most promising but has been withdrawn because of a possible health hazard. Because it is now possible to remove phosphate from waste water by chemical precipitation and because detergent phosphate is only one part of the total phosphate in sewage effluents, removal from the waste water rather than the detergent product should be considered. (Mortland-Battelle)
W72-06837

GUIDEBOOK FOR THE 36TH ANNUAL FIELD CONFERENCE OF PENNSYLVANIA GEOLOGISTS.
For primary bibliographic entry see Field 02J.
W72-06926

ENVIRONMENTAL FACTORS AFFECTING THE UTILIZATION OF GREAT LAKES FISH AS HUMAN FOOD,
E. G. Bligh.
Limnos, Vol. 4, No. 1, p 13-18, Spring 1971. 5 fig, 3 tab.

Descriptors: *Fish, *Great Lakes, *Environment, *Public health, Bacteria, Botulism, DDT, Quality control, Pollutant identification, Pesticides, Environmental effects, Water pollution effects.
Identifiers: *Fisheries, *Human food, Contamination, Biological aspects, Fish supply, Fish flavor, Mercury pollution, Surveillance.

The effects of environmental degradation in the Great Lakes upon the use of fish as human food are discussed. The effects are of two types: (1) biological effects on the fish themselves, and (2) public health aspects in relation to human consumption. The biological effects include: reduction in the availability of some of the more choice or aggressive fishes, off-odors, and off-flavors in the fish, bacterial contamination of fish and presence of botulinum organisms. The public health aspects of the contamination of fish include poisonous substances which cannot be detected by the consumer, such as DDT in the food chain. A number of fish species from the Great Lakes are no longer acceptable as human food, and other species are fast approaching the maximum allowable limit for DDT content. An additional environmental factor which is seriously affecting fisheries on the Great Lakes is pollution with mercury. Studies have revealed that mercury pollution is a very real and serious threat to the fisheries of the Great Lakes. There is ample evidence that pesticide and mercury contamination in fish can prevent the utilization of Great Lakes fish as human food. Other heavy metals and new pesticides must be examined in this light, and methods must be developed to ensure continued surveillance of their affects on fisheries. Changes in the environment can lead to marked changes in the availability of fish species, or even render them unacceptable for human consumption. (Strachan-Chicago)
W72-06937

OUTLINE OF ENVIRONMENTAL SCIENCES,
Illinois, Univ., Urbana. Dept. of Entomology; and Illinois Univ., Urbana. Dept. of Zoology.
For primary bibliographic entry see Field 06G.
W72-06941

BOTTOM SEDIMENTS OF LAKE CHAMPLAIN: 1965-1971,
Vermont Univ., Burlington. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-06975

CHEMICAL QUALITY OF WATER IN THE WALNUT RIVER BASIN, SOUTH-CENTRAL KANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-07025

CONTRIBUTION TO THE BIOLOGY OF CHONDROSTOMA NASUS VARIABILE (PISCES, CYPRINIDAE) FROM THE SEVERSKY DONETZ THERMAL REGION, (IN RUSSIAN),
Akademiya Nauk USSR, Kiev. Instytut Zoologii.
A. Y. Shcherbukha.
Zool Zh. 50 (5): 713-723. 1971. Illus. English summary.
Identifiers: Biology, Chondrostoma-Nasus-Variabile, Cyprinidae, Donetz, Growth, Maturation, Pisces, Seversky, Spawning, Thermal, USSR.

As a result of discharge of heated waters of the Lugansk hydroelectric station to the Seversky Donetz, the temperature of water in the latter increases from 6-8 degrees to 10 degrees. Chondrostoma inhabiting the heated waters spawn earlier and their condition during hibernation is improved as compared with that during the period of feeding. During the 1st 2 yr of life they grow slower than in the region with the natural thermal regime. In spite of this, Chondrostoma of the Seversky Donetz grow more intensely, they are fatter and their sexual maturation occurs earlier than in the Don and some other water bodies. At the same time meristic characters markedly vary, suggesting a higher plasticity of this species.--Copyright 1971, Biological Abstracts, Inc.
W72-07031

BOVINE HEPATIC DISTOMATOSIS IN THE LORRAINE REGION. INTRODUCTION TO THE ECOLOGY OF THE INTERMEDIATE HOST OF FASCIOLA HEPATICA, LYMNAEA TRUNCATULA MULLER,
Ecole National Superieure d'Agronomie, Nancy (France. service Entomol.
M. Aubert, P. Cachan, and H. Descharmes.
Bull Ecole Nat Super Agron Nancy. 12 (1/2): 3-11. 1970. Illus.
Identifiers: Bovine, Carex-Vulpina-M, Distomatosis, Ecology, Fasciola-Hepatica, Galium-Palustre-D, Glyceria-Fluitens-D, Hepatic, Host, Intermediate, Juncus-Effusus-M, Lorraine, Lymnaea-Truncatula, Mentha-Aquatica-D, Phragmites-Communis-M, Rain, Ranunculus-Repens-D, Roripa-Amphibia-D.

Several cases of bovine deaths in the Nancy region due to distomiasis led to a study on the importance of this disease is Lorraine and on the ecology of its principal vector. The extent of distomiasis in Lorraine is related to the presence of many days meadows that harbor the vector. The rate of infection of animals from Lorraine and particularly from the Meurthe-et-Moselle department was 62.8% in cows and heifers and 48.3% in steers during the 1st mo. of 1969. A new outbreak was noted in relation to the 2 preceding yr and could be explained only by an especially high amount of rain. On the farm studied, the mollusk was especially abundant at a point of the slope leading down to the brook; it was equidistant from the zone of free water at the low water mark and from the maximum flood level. This zone was characterized by various species of plants: Phragmites communis, Glyceria fluitens, Mentha aquatica, Galium palustre, and Roripa amphibia. Lymnaea were more abundant in the upper level characterized by Juncus effusus, Carex vulpina, and Ranunculus repens. The zones likely to be dangerous for the bovines can be directly determined by extracting the Lymnaea from the humid soil or indirectly determined by searching for the plants characteristic of the biotopes that harbor the mollusk.--Copyright 1971, Biological Abstracts, Inc.
W72-07038

SHORT-TERM EFFECTS OF 2,4-D ON AQUATIC ORGANISMS IN THE NAKWASINA RIVER WATERSHED, SOUTHEASTERN ALASKA,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 05G.
W72-07071

A METHOD OF SUSPENDING MULTIPLE BASKET SAMPLERS IN RESERVOIRS,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05A.
W72-07123

THE USE OF LIMESTONE-FILLED BASKET SAMPLERS FOR COLLECTING RESERVOIR MACROINVERTEBRATES,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05A.
W72-07124

CHARACTERISTICS AND EFFECTS OF CATTLE FEEDLOT RUNOFF,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05B.
W72-07126

THE RESPONSE OF MACROBENTHOS TO IRRIGATION RETURN WATER,
Robert S. Kerr Water Research Center, Ada, Okla.
R. D. Kreis, and W. C. Johnson.
Journal Water Pollution Control Federation, Vol. 40, No. 9, Sept 1968. p 1614-1620, 3 fig, 2 tab, 7 ref. EPA Program 13030--09/68.

Descriptors: *Benthos, *Irrigation water, *Farm wastes, Rivers, Salts, Nutrients, Pesticides, *Irrigation effects, *Return flow, *Water pollution effects.
Identifiers: *Macroinvertebrates, *Tolerance, Wildlife refuges, Return flows, Agricultural valleys.

A survey of the benthos of the Lost River and Klamath Rivers located along the Oregon-California state line was conducted to determine changes in the macroinvertebrate community structure caused by irrigation return flows. Significant changes from clean water organisms to pollution tolerant taxa coincided with increased usage of

Lost River water for irrigation purposes. The drainage of the Lost River, which transports water used several times for irrigation, to the Klamath River caused similar changes in the community structure of the Klamath River benthos. (EPA abstract)
W72-07127

EFFECTS OF THERMAL INCREMENTS ON EGGS AND YOUNG OF COLUMBIA RIVER FALL CHINOOK,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
P. A. Olson, R. E. Nakatani, and T. Meekin.
Available from the National Technical Information Service as BNWL-1538, $3.00 in paper copy, $0.95 in microfiche. September 1, 1970. 57 p, 25 fig, 8 tab, 14 ref. Contract No. AT (45-1)-1830.

Descriptors: *Thermal pollution, *Chinook salmon, *Mortality, Water temperature, Columbia River, Fish eggs, Dissolved oxygen, Hydrogen ion concentration, Water quality, Water pollution effects, Bioassay, Spawning, Fry.
Identifiers: Oncorhynchus tshawytscha, Salmo salar.

A 177 day study was conducted on the temperature tolerance of various developmental stages of chinook salmon originating from adults spawning between October and December in the Priest Rapids area of the Columbia River. Four series of spawn were tested. Lots within series were subjected to seven temperature increments differing by intervals of about 2 F, which encompassed a test range of 12 F. Because of falling river temperatures after the start of the initial experiment, successively later series tolerated greater than thermal increments. Mortality patterns and time of mortality were related to temperature increases. High egg mortality occurred at the warmest temperatures, but there was considerable embryonic development even in those lots, and most deaths (coagulation) occurred just prior to hatching. Lots with excessive egg mortalities also experienced greater losses during the fry stage. Under cooler, but still adverse temperature treatments, eggs and fry mortalities were not obviously greater, but increased losses occurred primarily during the critical transition period at commencement of active feeding. Increased temperature clearly accelerated growth. This study indicates that the developmental stages of fall chinook can safely withstand greater thermal additions during winter when temperatures are low. It also suggests that elevated temperatures will favor egg and fry survival of late spawners over those of the earlier when spawning temperatures were higher. (Mortland-Battelle)
W72-07129

CIRCADIAN MIGRATIONS AND FEEDING RHYTHM OF SOME INDIAN OCEAN EUPHAUSIID SPECIES,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
L. A. Ponomareva.
Okeanologiya, Vol. 11, No. 2, p 226-231, 1971. 2 fig, 3 tab, 11 ref.

Descriptors: *Crustaceans, *Marine animals, *Migration patterns, *Food habits, *Plankton, Indian Ocean, Copepods, Biomass, Biorhythms, Distribution patterns, Diurnal distribution, Zooplankton, Amphipoda, Fish eggs, Phytoplankton, Protozoa, Larvae, Gastropods, Dinoflagellates.
Identifiers: *Circadian rhythm, Euphausiids, Krills, Nematoscelis microps, Nematoscelis gracilis, Euphausia diomedeae, Euphausia pseudogibba, Euphausia distinguenda, Thysanopoda monocantha, Thysanopoda aequalis, Thysanopoda acutifrons, Pseudeuphausia latifrons, Calanus finmarchicus, Calanus helgolandicus, Foraminifera, Stylocheiron, Tintinnids, Radiolarians, Nectochaeta, Ostracods, Echinopluteus, Ophiopluteus, Limacina, Veliger, Candacta, Rhincalanus, Appendicularia.

The circadian rhythm of migrations and feeding among some species of tropical euphausiids is discussed and a description is given of the qualitative composition of their food. Vertical migrations of such bathypelagic species as Nematoscelis microps and Nematoscelis gracilis were almost non-existent. However, among the species inhabiting the 0 to 500 m layer (e.g., Euphausia diomedeae) such migrations are quite vigorous, especially among the older crustaceans (2 years old). Species that migrate little also exhibit no circadian feeding rhythm. This rhythm is most pronounced in the actively migrating older Euphausia diomedeae crustaceans. The diet of the species under study is highly varied (determined from 30 food components). All species studied are omnivorous. (Holoman-Battelle)
W72-07131

ECOSYSTEM ALTERNATION BY MOSQUITOFISH (GAMBUSIA AFFINIS) PREDATION,
San Diego State Coll., Calif. Dept. of Biology.
S. H. Hurlbert, J. Zedler, and D. Fairbanks.
Science, Vol. 175, No. 4022, p 639-641, February 11, 1972.

Descriptors: *Ecosystems, Food chains, *Zooplankton, *Predation, *Bioassay, Biological communities, Dominant organisms, Aquatic environment, Aquatic algae, Aquatic animals, Aquatic insects, Daphnia, Aquatic populations, Fish diets, Freshwater fish, Ponds, Lakes, Food habits, Eutrophication, Larvae, Rotifers, Aquatic microorganisms, Diptera, Phosphorus, Water temperature, Water chemistry, Water analysis, Copepods, Cyanophyta, Mayflies, Phytoplankton, Sessile algae, Cycling nutrients, Biomass, Chara, Light penetration, Benthic flora, Model studies, Aquatic life, Crustaceans, Fish, Analytical techniques.
Identifiers: *Gambusia, Cyclops nauplii, Coccochloris peniocystis, Spirogyra, Ephemeroptera baetidae, Ephydra, Chaetogaster, Aeolosoma, Chaoborus, *Gambusia affins, Ephemeroptera, Menidia, Brachydeutera, Chydorus sphaericus, Chydorus, Monostyla, Lepadella, Trichocerca, Haematococcus lacustris.

A model ecosystem consisting of eight plastic pools, 2 m in diameter and 30 cm deep, was set up outdoors to determine the effect of fish on biological populations and phosphorus cycle. A 3 cm layer of sand, tap water to a depth of 20 cm, a liter of dry alfalfa pellets as a source of nutrients, and inocula of plankton from a lake and from a laboratory colony of Daphnia pulex were added to each pool. Mosquitofish (Gambusia affins) were added to three pools with the remaining pools serving as controls. The status of the system was determined by regular sampling of phytoplankton, zooplankton, insect population, benthos, algae, and by determination of phosphorus content, water temperature, and transparency. Gambusia affins greatly reduced rotifer, crustacean, and insect populations and thus permitted extraordinary development of phytoplankton populations (2 x 108 cells per milliliter). Other effects included decreased optical transmissivity and increased temperature of the water, decreased amounts of dissolved inorganic phosphorus, and increased amounts of dissolved organic phosphorus, inhibition of Spirogyra, and replacement of one annelid, Chaetogaster, by another, Aeolosoma. The results of the experiment also indicated fish can be used as a possible controlling agent for eutrophication. Further, the biologic changes in aquatic systems are primarily a result of changes in the aquatic food chain. (Snyder-Battelle)
W72-07132

THE FAUNA ON AQUATIC VEGETATION IN THE INUNDATION REGION OF APATIN, (IN GERMAN),
Bioloski Institut, Belgrade (Yugoslavia).
V. M. Jankovic.
Archiv fur Hydrobiologie, Vol. 36, No. 4, p 384-392, August 1971. 6 tab, 4 ref. (English summary).

Descriptors: *Aquatic plants, *Aquatic animals, Oligochaetes, Mites, Mollusks, Larvae, Aquatic insects, Distribution patterns, Diptera, Midges, Mayflies, Caddisflies, Dragonflies, Insects, Water quality, Sampling.
Identifiers: *Phytomacrofauna, Trichoptera, Odonata, Damselflies, Coleoptera, Beetles, Ceratophyllum demersum, Myriophyllum verticillatum, Trapa natans, Nymphoides flava, Stylaria, Caenis, Hydracarina, Endochironomus, Tanytarsus gr lauterborni, Tanytarsus gr gregarius, Cryptochironomus gr pararostratus, Cryptochironomus gr viridulus, Polypedilum gr convictum, Polypedilum, Limnochironomus gr tritomus, Limnochironomus gr nervosus, Glyptotendipes polytomus, Endochironomus gr tendens, Sergentia gr longiventris, Cricotopus gr algarum, Cricotopus gr silvestris, Psectrocladius gr psilopterus, Psectrocladius medius, Orthocladius gr saxicola, Corynoneura, Ablabesmya gr monilis, Ceratophyllum, Myriophyllum, Trapa.

Qualitative sampling of floating and submerged plants, done every two months throughout the spring, summer, and fall of 1968 in an inundation region, revealed a diversified fauna which included eleven animal groups. Five to six groups were associated with the floating vegetation and about ten with the submerged vegetation. The floating plants, though consisting of lower numbers of animal groups, displayed a more diversified composition of chironomid larvae, the most frequently occurring group of animals. Representatives of the Oligochaeta, Ephemeroptera and Hydracarina were found on all plants. Seasonal changes in the fauna were considered to be due mainly to changing proportions of the common species and only partly to the appearance of new species. A different species attained greatest abundance on each plant. (Holoman-Battelle)
W72-07140

COMPARATIVE STUDY OF SPECIES NAUTOCOCCUS MAMMILATUS AND NAUTOCOCCUS PYRIFORMIS (TETRASPORALES),
Ceskoslovenska Akademie Ved, Trebon. Lab. of Algology.
J. Lukavsky.
Archiv fur Hydrobiologie, Vol. 39, No. 4, p 245-258, October 1971. 70 fig, 18 ref.

Descriptors: *Algae, *Systematics, *Plant morphology, Reproduction, Life cycles, Aquatic algae, Periphyton.
Identifiers: Epineustont, Nautococcus mammilatus, Nautococcus pyriformis nautococcus, Apiococcus, Oscillatoria, Nautococcus caudatus, Nautococcus constrictus, Nautococcus emersus.

The morphological variability and the kind of reproduction of tetrasporal alga Nautococcus mammilatus Korsh. in nature and in the culture were studied and compared with the culture of two strains of Nautococcus pyriformis Korsh. The stability and taxonomical value of some features, namely the morphology and the cell structure, the kind of floating, the morphology of the floating cap and the morphology of zoospores were studied. For the first time the isogamical sexual process of one strain, Nautococcus pyriformis, was observed. The surface film of water is considered not to be the reason of floating of the cells of Nautococcus; the cells are lifted by gas bubbles. The diagnosis of the genus Nautococcus Korsh. was extended, the genus Apiococcus Korsh. was included as a synonym. (Holoman-Battelle)
W72-07141

THE COURSE OF MINERAL NUTRIENT CONSUMPTION IN THE CULTURING OF SCENEDESMUS QUADRICAUDA, (TURP.) BREB. PART 3. NITROGEN UPTAKE, (IN GERMAN),
Ceskoslovenska Akademie Ved, Trebon. Lab. of Algology.
V. S. Pribil, and P. Marvan.

Archiv fur Hydrobiologie, Vol. 39, No. 4, p 334-348, October 1971. 6 fig, 34 ref. (English summary).

Descriptors: *Scenedesmus, *Nutrients, *Absorption, *Mineralogy, Nitrogen, Ions, Cultures, Phosphorus, Chlorella, Chlorophyta, Nitrogen compounds, Ureas, Inhibition, Biomass, Growth rates, Metals, Ammonia, Nutrients, Bioassay, Nitrates, Phosphates.
Identifiers: Scenedesmus quadricauda, Chlorella pyrenoidosa, Chlorella vulgaris, Scenedesmus obliquus.

The course of nitrogen consumption (milligrams of nitrogen per liter dry weight) during the cultivation of Scenedesmus quadricauda strain Greifswald/15 in media with graduated nitrogen and phosphorus concentrations and its influence upon the growth and the process of cell evolution were followed. Urea and ammonium ions were used as a source of nitrogen. Within the observed range of nitrogen concentrations (3-2000 milligrams of nitrogen per liter) and phosphorus concentrations (3-1000 milligrams of phosphorus per liter) the consumption of nitrogen rises with increasing nitrogen and phosphorus concentrations. The optimum extent of nitrogen concentration in media is 100-300 milligrams of nitrogen per liter from the point of view of biomass production. The highest consumption of phosphorus is also within the range of these nitrogen concentrations. The most intensive cell division is in the nitrogen concentrations higher than optimal ones for growth of culture. The highest production of two celled coenobia was also observed at these nitrogen concentrations. Immediately after the transfer of inoculum into the nutrient solution the preferred and rapid uptake of ammonium ions takes place. Their concentration in media again increases later, particularly in experiments with the higher concentration of urea. First of all, the inhibition of cell division (approximately after the fifth day) and then only the inhibition of growth (approximately after the tenth day) occur after the exhausting of nitrogen from media. (Holoman-Battelle)
W72-07142

ION TRANSPORT STUDIES ON PHYTOPLANKTON OF A FISH POND AT ILE--IFE,
Ife Univ. (Nigeria). Dept. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W72-07143

THE MICROCHAMBER CULTIVATION OF ALGAE,
Ceskoslovenska Akademie Ved, Brno. Lab. of Scientific Film.
J. Hrib, and V. Brezina.
Archiv Fur Hydrobiologie, Vol. 39, No. 4, p 349-354, October 1971. 2 fig, 13 ref.

Descriptors: *Aquatic algae, *Chlorophyta, *Growth chambers, *Life cycles, Cultures, Water quality, Scenedesmus, Laboratory equipment, Photography.
Identifiers: *Synchronous cultures, Scenedesmus soli, Scenedesmus quadricauda, Mougeotia, Ulothrix aequalis, Stephanopyxis turris.

A cultivation method for algae by the system of microchamber cultivation is presented. The method enables continual cultivation of algal cells with the possibility of cinematographic registration, especially of time lapse microcinematography. The system of the cultivation microchamber is divided into four sections: a cultivation section, a micromanipulation section, a light section and a cinematographic section. The main part of the system is a cultivation chamber which is of flowing character with the possibility of simple micromanipulation. This system proved to be useful in studying the ontogenetic cycle of the alga Scenedesmus quadricauda, strain Greifswald/15. (Holoman-Battelle)
W72-07144

OPTICAL DENSITY PROFILES AS AN AID TO THE STUDY OF MICROSTRATIFIED PHYTOPLANKTON POPULATIONS IN LAKES,
Minnesota Univ., Minneapolis. Limnological Research Center.
A. L. Baker, and A. J. Brook.
Archiv Fur Hydrobiologie, Vol. 69, No. 2, p 214-233, October 1971. 12 fig, 1 tab, 14 ref.

Descriptors: *Phytoplankton, *Lakes, *Turbidity, *Profiles, Photometer, Hypolimnion, Epilimnion, Lake Morphometry, Distribution patterns, Aquatic algae, Limnology, Chrysophyta, Euglenophyta, Pyrrophyta, Biomass, Hydrogen ion concentration, Minnesota, Water temperature, Dissolved oxygen.
Identifiers: *Microstratification, *Optical density, Microammeter, Oscillatoria agardhii var isothrix, Lake Itasca, Lake Elk, Lake Mary, Lake Josephine, Lake Arco, Lake Deming, Lower La Salle Lake, Lake Long, Lake Squaw, Lake Budd, Oscillatoria redekei, Lyngbya limnetica, Anabaena spp., Chromatium, Merismopedia trolleri, Cryptomonads, Stichogloea deoderleinii, Aphanizomenon flos-aquae, Mallomonas acaroides, Oscillatoria ornata, Turbidimeter, Metalimnion.

Turbidity profiles of ten north-central Minnesota lakes have been determined with a Schenk-turbidimeter. The lakes were studied at relatively close time intervals and each time a turbidity profile was taken, temperature and dissolved oxygen profiles and in many cases pH and conductivity profiles were also determined. Some of these data are graphed with the optical density profiles for each lake. Observed differences in turbidity were correlated with the microstratification of specific populations of phytoplankton. The turbidity profiles demonstrated the following: (1) Movement and disruption of microstrata during vernal and autumnal overturn, their reappearance under ice in winter and especially in the metalimnion in early summer; (2) Pronounced microstratification especially in small lakes with relative depth values greater than 5.0 meters; and (3) Integrity and stability of the microstrata. There is a discussion of the turbidity profiles as compared with those recorded by other investigators and the causes of optical density maxima other than by phytoplankton. (Holoman-Battelle)
W72-07145

STUDIES ON MORPHOLOGY, NUTRITIONAL REQUIREMENTS, BIOCHEMICAL ACTIVITY AND ANTIBIOTIC RESISTANCE OF HETEROTROPHIC WATER BACTERIA,
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology; and Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
E. Strzelczyk, E. Antczak, and H. Kuchcinska.
Archiv Fur Hydrobiologie, Vol. 69, No. 1, p 95-105, August 1971. 7 tab, 16 ref.

Descriptors: *Aquatic bacteria, *Nutrient requirements, *Resistance, Antibiotics (Pesticides), Bactericides, Water quality, Bioindicators, Aquatic plants, Periphyton, Benthic flora, Mud, Cultures, Isolation, Water quality, Eutrophication.
Identifiers: *Biochemical activity, *Morphology, Bacitracin, Chloromycetin, Polymyxin, Gram-negative rods, Heterotrophic bacteria, Pleomorphic bacteria, Cocci, Tetracycline, Erythromycin, Penicillin, Novobiocin, Streptomycin, Aureomycin, Terramycin, Neomycin, Thiamine, Biotin, Pyridoxine, Pantothenic acid, Nicotinic acid, Riboflavin, Vitamin B12, Lake Jeziorak, Elodea canadensis, Arthrobacter, Nocardia, Corynebacterium, Poland, Sample preparation.

Since very little is known about heterotrophic bacteria inhabiting water, these bacteria were isolated from water, mud, and submerged plant (Canadian pondweed) samples taken aseptically from the eutrophic Lake Jeziorak (Poland). In order to determine whether or not different ecological zones or the lake are inhabited by specific bacteria, different tests were employed to characterize the isolates. Characterization was based on morphological characteristics, nutritional requirements, biochemical activity, and antibiotic resistance. Morphological studies showed that different organisms occur in different habitats: (1) Water--60 percent Gram negative rods, 20 percent pleomorphic types; (2) Mud--60 percent branching forms, 20 percent cocci; (3) Plants--93 percent epiphytic Gram negative rods. Tabular data indicate distinct differences as well in nutritional requirements, biochemical activity, and antibiotic resistance depending on the sampling location. (Holoman-Battelle)
W72-07146

REGULATION OF CONTINUOUS CULTIVATION OF CANDIDA TROPICALIS BY ALTERATION OF PH OF MEDIUM,
Institut Fiziki, Krasnoyarsk (USSR).
N. S. Pechurkin, I. N. Pozmogova, and I. A. Terskov.
Prikladnaya Biokhimiya i Mikrobiologiya, Vol 5, No 2, p 123-127, March-April 1969. 2 fig, 4 ref.

Descriptors: *Fungi, *Yeasts, *Hydrogen ion concentrations, *Cultures, Carbon, Heterogeneity.
Identifiers: *Continuous cultivation, *pH-stat method, Paraffin, Hydrocarbons, Culture media, Rider's medium, Densitostat, Candida tropicalis, Thermal tolerance.

Since there is a direct correlation between growth rates of microorganisms and change of pH, measurement of pH changes can be used in monitoring and controlling rates of growth. A 'pH-stat' method, which uses electrodes to monitor pH and provide feedback for modifying the pH of the system, was developed and tested with the thermotolerant yeast Candida tropicalis T-20. Culturing was carried out in Rider's medium (basal salt medium) with one percent liquid paraffin (GOST 1747-64) at 36 C in a 40 cultivator. The work was carried out on a Biostend-1 apparatus. This pH-static method can be used (1) for the cultivation of Candida tropicalis in media containing paraffin as the sole carbon source and (2) in the case of optically inhomogeneous media, that is, under conditions where the densitostat encounters difficulties. (Holoman-Battelle)
W72-07160

EFFECT OF MICROORGANISMS ON THE PROPERTIES OF OIL FUELS,
Moscow State Univ. (USSR).
S. E. Krein, K. I. Bessmertnyi, I. T. Nette, and N. N. Grechushkina.
Prikladnaya Biokhimiya i Mikrobiologiya, Vol 5, No 2, p 186-189, March-April 1969. 3 tab, 10 ref.

Descriptors: *Oil, *Bacteria, Fuels, Acidity, Resins, Thermal properties, Viscosity, Hydrogen ion concentration, Biomass, Cultures, Aromatic compounds, Biodegradation, Aging (Biological).
Identifiers: Oil characterization, Diesel fuel, Iodine, Thermal stability, Vaporization, Kerosene, Mycobacterium lacticolum, Pseudomonas pyocyaneus, Hydrocarbons.

The effects of Mycobacterium lacticolum and Pseudomonas pyocyaneus on the performance and physiochemical properties of kerosene and diesel fuels were studied. Both bacteria grew on these fuels, with the former growing better on kerosene and the latter growing better on diesel fuels. The bacteria tended to increase the acidity and resin content of the fuels. There was also an increase in refractive index and some decrease in thermal stability. In all cases the Pseudomonas caused a greater change in thermal stability. Growth of the bacteria increased vaporization of the fuels and considerably increased the iodine number of sulfurous diesel fuel. With all other fuels the change in iodine number was relatively small. It was concluded that the action of the bacteria caused a marked deterioration in performance and physiochemical properties of the fuels. (Mortland-Battelle)
W72-07162

EXAMINATION OF CLOSTRIDIUM BOTULINUM IN SAMPLES TAKEN FROM LAKE TOWADA,
Hirosaki Univ. (Japan). Faculty of Medicine.
Koichi Yamamoto, Heiji Kudo, Hiroshi Asano, Yuya Seito, and Shodo Nabeya.
Hirosaki Med J. 22 (1): 92-96. Illus. Maps. 1970. Japanese summary.
Identifiers: Botulism, Clostridium-Botulinum, Examination, Human, Japan, Lake, Samples, Towada, Trout.

In June 1967 3 cases of botulism (1 fatal) occurred in a family that had eaten lake trout. Soil and sand samples were taken 100 m from the shore of Lake Towada, the fish source, and from along the Oirase River where the fish had been washed. In addition, 110 lake trout were examined. Results showed that C. botulinum types E and F was present in Lake Towada, and that botulism organisms are widespread in Aomori prefecture. Strains of type E (27) and type F (1) were isolated from 172 lake samples; 2 type E strains were isolated from 72 river samples; and type E strains (3) and type F (2) were found in the fish specimens. The isolation of type F was the first in Japan.--Copyright 1971, Biological Abstracts, Inc.
W72-07163

PHOSPHORUS UPTAKE BY PLANKTONIC ALGAE IN THE DARK AND UNDER FAINT LIGHT,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
D. K. Krupatkina.
Okeanologiya, Vol 11, No 2, p 221-226, 1971. 3 tab, 18 ref.

Descriptors: *Algae, *Phytoplankton, *Absorption, *Aquatic algae, *Light intensity, *Phosphorus, Plankton, Chlorophyta, Pyrrophyta, Dinoflagellates, Primary productivity, Mineralogy, Light, Cultures, Bioassay.
Identifiers: Phaeodactylum tricornutum, Gonyaulax polyedra, Platymonas viridis, Chaetoceros curvisetus, Skeletonema costatum, Glenodinium foliacum, Gyrodinium fisum.

The uptake of mineral phosphorus and organic phosphorus in the dark and under faint light by planktonic algae not deficient in phosphorus has been investigated. Six species of planktonic algae (green, diatom, dinoflagellate) were studied. Mineral phosphorus was taken up in the dark by cells not deficient in phosphorus in most species (except Phaeodactylum tricornutum and Gonyaulax polyedra). The phosphorus content increased 1.5- to 2.5-fold when the cells (percent of dry weight) were kept in the dark for 3 days. Organic phosphorus was taken up both in the dark and in the presence of light. Some species (Platymonas viridis and Chaetoceros curvisetus) take up mineral phosphorus and organic phosphorus simultaneously both in the dark and in the presence of faint light, while others (Phaeodactylum tricornutum and Gonyaulax polyedra) take up only organic phosphorus. The sources of organic phosphorus in the medium are the intravital excretions of cells and decomposition products of dead algae. Organic phosphorus in the medium constitutes 2 percent of the dissolved and total P. All supporting data are tabulated. (Holoman-Battelle)
W72-07166

DISTRIBUTION OF TAXOCENOSES OF FORAMINIFERA ON THE CONTINENTAL TERRACE OF SOUTH AMERICA IN THE PACIFIC,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
T. A. Khusid.
Okeanologiya, Vol 11, No 2, p 218-220, 1971. 1 fig, 11 ref.

Descriptors: *Distribution patterns, *Protozoa, Pacific Ocean, Continental shelf, Bioindicators, Sediments, Calcium carbonate, Benthic fauna, Plankton, Oxygen, Water temperature, Littoral.
Identifiers: *Taxocenoses, *Foraminifera, Biocenoses, Bathyal zone, Agglutinating foraminifera, Brizalina, Epistominella, Buliminide taxocenosis, Uvigerina, Astrorhizide-ammodiscide taxocenosis, Smyrnella, Hyperammina, Rhizammina, Vertical distribution.

Thirty grab samples were collected from five parallel profiles (5, 8, 12, 21 and 23 degrees South) during 1968 from the continental terrace off South America to study the horizontal and vertical distributions of benthic foraminiferans in the bottom deposits of the Pacific. Analysis of the samples showed a sharp decrease in the number of foraminiferal species and an increase in the role of agglutinating forms on the continental terrace of South America in the Pacific, especially in the sublittoral zone and to a lesser extent in the bathyal zone. This is caused by upwelling of cold water. Two taxocenoses, buliminide and astrorhizide-ammodiscide are distinguished. In other tropical regions of the Pacific with normal oceanic conditions, they are found at greater depths. (Holoman-Battelle)
W72-07167

DISTRIBUTION OF FORAMINIFERA ALONG THE PACIFIC COAST OF SOUTH AMERICA,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
Kh. M. Saidova.
Okeanologiya, Vol 11, No 2, p 210-217, 1971. 3 fig.

Descriptors: *Protozoa, *Distribution patterns, *Benthic fauna, *Plankton, *Sediments, Biomass, Pacific Ocean, Bioindicators, Zooplankton, Sedimentation, Sea water, Dissolved oxygen, Continental shelf, Productivity, Calcium carbonate, Shallow water, Deep water, Water quality.
Identifiers: *Foraminifera, Biocenosis, Planktonic foraminifera, Benthic foraminifera, Agglutinating foraminifera, Secreting foraminifera, South America, Nonionella, Brizalina, Reophax, Smirnella, Uvigerina, Atacama Trench, Astrorhizida, Ammodiscida, Vertical distribution, Globorotalia, Globigerinella, Globigerina.

A study of the distribution of benthic and planktonic foraminiferans in the regions of the Pacific adjacent to South America from the equator to 30 degrees South showed that the total number of benthic foraminiferans decreases with depth (but unevenly) on the continental slope of South America between 0 and 23 degrees South. Three peaks of the benthic foraminiferal biomass can be distinguished: (1) on the upper part of the continental shelf, (2) on the continental slope, and (3) on the slope of the Atacama Trench. Zones of low biomass occur between them. The upper peak is confined to depths of 150 to 250 m and it reflects the low amount of oxygen in the water. The shallow-water foraminiferans living under good aeration conditions require a relatively high oxygen content in the water. The agglutinating species are absent when the oxygen content is 0.3 ml/liter or less and the organic matter content in sediments is high while the secreting species are reduced to one-tenth their normal population. The distribution of planktonic foraminiferans is related to the system of surface currents. The number of planktonic foraminiferans decreases downward. Down to depths of 500 m the species composition is similar to that in the surface waters, an indication that the dead shells sink to the bottom very rapidly. The number of shells in water below the productive layer varies both with the number in this layer and with the aggressiveness of the water below toward CaCO3. (Holoman-Battelle)
W72-07168

EFFECT OF ADVECTION AND BIOCHEMICAL PROCESSES ON THE VERTICAL DISTRIBUTION OF PHOSPHORUS IN THE TROPICAL OCEAN,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 05B.
W72-07169

RESPIRATION RATE OF AQUATIC MICROFLORA IN GLASS CONTAINERS WITH DIFFERENT VOLUMES,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
V. I. Romanenko.
Mikrobiologiya, Vol 38, No 6, p 947-949, November-December 1969. 1 fig, 1 tab, 7 ref.

Descriptors: *Respiration, *Biodegradation, *Biochemical oxygen demand, *Volume, *Bioassay, *Cultures, Aquatic microbiology, Organic matter, Interfaces, Laboratory equipment, Aquatic populations, Incubation, Seasonal, Statistical methods, Water quality.
Identifiers: *Saprophytic bacteria, Data interpretation, Laboratory techniques, Winkler method, Water-glass interface.

Bottle tests for BOD were conducted in bottles of 60 ml and 20,000 ml to determine whether laboratory tests are representative of natural conditions. It has been shown in the past that the contact between glass surfaces and water samples tends to transform the organic matter and increase the biological activity. Because of the large difference in glass-water contact in the two size bottles (ratio of 330:1), the effect of the glass-water interface would be easily detected. Water samples were collected from Rybinskii Reservoir and incubated in the dark for one day. Thirty replicate tests were conducted. The results, which were statistically analyzed, showed that there is no difference in oxygen consumption in containers of different volumes for one day incubation periods. It is therefore concluded that the rate of microbiological processes in these tests corresponds to that under natural conditions. It was further found in prolonged tests with water taken under winter ice that oxygen consumption in bottles decreased at the same rate as in the reservoir itself. (Snyder-Battelle)
W72-07170

MICROBIOLOGICAL PROCESSES IN LAKE MEKHTEB,
Dagestanskii Nauchno-Issledovatelskii Institut Selskogo Khozyaistva, Makhachkala (USSR). Dagestan Scientific-Research Institute of Agriculture, Makhachkala.
L. A. Aliverdieva-Gamidova.
Mikrobiologiya, Vol 38, No 6, p 943-946, November-December 1969. 2 tab, 8 ref.

Descriptors: *Aquatic bacteria, *Aquatic plants, *Aquatic fungi, Hydrogen sulfide, Clostridium, Temperature, Bulrushes, Microbiology, Aerobic bacteria, Azotobacter, Water analysis, Mud, Actinomycetes, Fungi, Oxidation, Decomposing organic matter, Odor, Degradation (Decomposition).
Identifiers: *Lake Mekhteb, Sulak River, Dagestan ASSR, Clostridium pasterianum, Mycobacteria, Hydrocarbons, Hydrogen-oxidizing bacteria, Hydrocarbon-oxidizing bacteria, Cellulose-decomposing bacteria, Methane-forming bacteria, Sulfate-reducing bacteria, Saprophytic bacteria.

Microbiological processes in a river-bottom lake (Lake Mekhteb) have been studied. Lake Mekhteb, located in the valley of Sulak River in the Dagestan ASSR, covers an area of 25 square kilometers and has black lake-bottom mud which gives off an odor of hydrogen sulfide. Water and mud samples from this lake were analyzed each month between January 1961 and December 1962 and the results tabulated. It was found that the aquatic flora have a strong influence on all microbiological processes and that these processes are most vigorous in summer when the bacteria reproduce vigorously, ceasing in winter when the temperature drops and the plants die. The total amount of bacteria reached 3-5 million per ml of water, while the saprophyte count reached tens of thousands per ml. The physiological groups of bacteria found included Azotobacter, Clostridium pasteurianum, and hydrogen-oxidizing, hydrocarbon-oxidizing, aerobic cellulose-decomposing, sulfate-reducing, and methane-forming bacteria. (Holoman-Battelle)

W72-07171

MOLLUSCICIDAL ACTIVITY OF AFLATOXIN,
Sao Paulo Univ. (Brazil). Faculdade de Medicina; and Sao Paulo Univ. (Brazil). Instituto de Medicine Tropical.
A. Purchio, and R. Campos.
Revista do Instituto de Medicina Tropical desano Paulo, Vol. 12, No. 4, p 236-238, July-August, 1970. 1 tab, 6 ref.

Descriptors: *Toxins, *Toxicity, *Molluscicides, Nuts, Mortality, Pesticides, Poisonous plants, Water pollution, Water pollution effects, Phytotoxicity, Bioassay, Lethal limit, Snails, Piscicides, Food processing industry.
Identifiers: *Aflatoxin, *Schistosomiasis, *Aspergillus sp., Biomphalaria sp.

The molluscicidal activity of culture medium extracts of Aspergillus parasiticus, the producer of aflatoxin B-1, were studied. This substance caused the death of all snails (Biomphalaria tenagophila) when used at the concentration of 0.5 mg/l in static bioassay. Ten mg/l were required to kill the fish, Lebistes spp. Aflatoxin is sometimes a contaminant of ground nut meals and other foodstuffs. Such contaminated material might have value in control of molluscan vectors of schistosomiasis. Field trials are suggested. (LeGore-Washington)
W72-07218

COPPER IN LYMNAEA STAGNALIS L.--II. EFFECT ON THE KIDNEY AND BODY FLUIDS,
Vrije Universiteit, Amsterdam (Netherlands). Dept. of Biology.
N. Spronk, F. G. Brinkman, R. J. Van Hoek, and D. L. Knock.
Comparative Biochemistry and Physiology, Vol. 38A, p 309-316. 2 fig, 4 tab, 15 ref.

Descriptors: *Copper, *Snails, *Water pollution effects, *Animal physiology, Metals, Bromine, Absorption, Gastropods, Invertebrates, Physiological ecology, Environmental effects, Neutron activation analysis, Toxicity.
Identifiers: *Lymnaea spp.

Snails (Lymnaea stagnalis) were exposed to 0.00005 M CuSO4 solutions. This caused losses of about 30% Na and Cl in their kidneys, with a parallel increase in copper content of about 40%. The concentration of bromine also increased. The kidney tissue was analyzed using neutron activation techniques. Increased water content of the kidneys after the CuSO4 treatment is explained by increased water influx from body fluids and less effective Na exchange. (LeGore-Washington)
W72-07219

ADAPTATION OF THE POLYCHAETE NEREIS DIVERSICOLOR TO ESTUARINE SEDIMENTS CONTAINING HIGH CONCENTRATIONS OF HEAVY METALS. I. GENERAL OBSERVATIONS AND ADAPTATION TO COPPER,
Marine Biological Association of the United Kingdom, Plymouth (England). Lab.
G. W. Bryan, and L. G. Hummerstone.
Journal of the Marine Biological Association of the United Kingdom, Vol. 51, p 845-863. 3 fig, 6 tab, 20 ref.

Descriptors: *Absorption, *Copper, *Zinc, *Water pollution effects, *Annelids, Metals, Mine wastes, Worms, Path of pollutants, Resistance, Toxicity.
Identifiers: Concentration coefficients, Polychaetes, Nereis sp.

The concentration of copper in Nereis diversicolor is roughly related to the total concentration in the sediment, and particularly high concentrations are found where mining pollution occurs. In contrast, the concentration of zinc in Nereis remains remarkably constant despite wide variations in the environment and appears to be accurately regulated. In worms from different estuaries, concentrations of copper have been related to those of the sediments, sediment extracts and interstitial water at different stations; and the influence of salinity and size of animal has also been considered. The relative importance of the absorption of copper via the gut or across the body surface is still uncertain, but uptake over the body surface appears to be important. In high-copper animals from polluted areas much of the metal is deposited in the epidermis of the body wall and in parts of the nephridia. High-copper animals survive in polluted areas because they have apparently developed a tolerance to the toxic effects of copper, which is neither readily lost, nor readily gained by non-tolerant animals. The situation may be similar to that found on old mine dumps where populations of metal-tolerant land plants have evolved. (LeGore-Washington)
W72-07220

STUDY ON THE TOXICITY OF AGRICULTURAL CONTROL CHEMICALS IN RELATION TO FRESHWATER FISHERIES MANAGEMENT NO. 6. CHRONIC TOXICITY OF DIELDRIN, LINDANE AND DIPETEREX TO CHERRY SALMON FINGERLINGS,
S. Kimura, M. Yokote, and Y. Matida.
Bulletin of Freshwater Fisheries Research Laboratory (Japan), Vol. 21, No. 1, p 107-116. 5 fig, 2 tab, 9 ref.

Descriptors: *Pesticide toxicity, *Dieldrin, *Lethal limit, *Salmon, *Water pollution effects, Chlorinated hydrocarbon pesticides, Environmental sanitation, Bioassay, Toxicity, Pesticides, Toxins.
Identifiers: *Lindane, *Dipterex, *Chronic toxicity, Cherry salmon, Japan.

Chronic toxicity of sublethal concentrations of dieldrin, lindane and dipterex to cherry salmon fingerlings was studied by long term continuous flow bioassay. Observations on mortality, growth, condition factors, appetite, food conversion, and pathological symptoms were made. The fish apparently acquired a degree of tolerance to the chemicals at certain concentrations. The acclimation and other results indicated that long term experiments are necessary before the establishment of adequate biological safety concentrations is possible. (LeGore-Washington)
W72-07221

2, 5-DI- (BENZOXAZOLE-2-YL)THIOPHENE, AN OPTICAL BRIGHTENER CONTAMINATING SLUDGE AND FISH,
Lantbrukhogskolan, Uppsala (Sweden). Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W72-07222

INVESTIGATIONS CONCERNING PROBABLE IMPACT OF NITRILOTRIACETIC ACID ON GROUND WATER,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05B.
W72-07223

THE EFFECTS OF HEATED WASTE WATERS ON SOME MICROORGANISMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
J. Cairns, and G. R. Lanza.
Available from the National Technical Information Service as PB-208 414, $3.00 in paper copy, $0.95 in microfiche. Water Resources Research Center Bulletin 48, February 1972. 101 p, 18 fig, 19 tab, 48 ref. OWRR B-017-VA (6).

Descriptors: *Thermal pollution, *Water pollution effects, *Aquatic microorganisms, *Investigations, *Analytical techniques, Data collections, Algae, Protoza, Fungi, Equipment, Instrumentation, Fluorescence, Water temperatures, Thermal stress.
Identifiers: Research, Chytridiaceous fungi, Heat shock.

The effects of heated waste water on aquatic microorganisms were studied. Numerous categories of temperature shock were investigated with emphasis on (1) general simulation of the passage of water through a condensing system of a steam electric power plant to determine the effects of this exposure and (2) the effects of such entrainment upon the microbial system below the discharge point. Three general groups of organisms were examined: protozoans, algae, and chytridiaceous fungi. New equipment developed specifically to aid in these studies (a simple apparatus for delivering heat shock to microorganisms) and a new fluorescent survey technique to characterize stress induced cellular alterations are described in detail. Results of the study are summarized in tables and graphs. (Woodard-USGS)
W72-07225

LIMNOLOGICAL CYCLES IN A PHOSPHATIC LIMESTONE MINE LAKE,
Florida Presbyterian Coll., St. Petersburg. Dept. of Mathematics and Natural Science.
George K. Reid, and S. Dexter Squibb.
Quart J Fla Acad Sci. 34 (1): 17-47. 1971. Illus.
Identifiers: Chaoborus, Chlorophyll, Cladocera, Copepoda, Cycles, Lake, Limestone, Limnological, Mine, Phosphatic, Phyto, Plankton, Rotifers, Tendipes.

Results of monthly limnological investigations during 1961-62 of a phosphate limestone mine lake are described. The lake is warm monomictic, and considerable amplitude of variation in water chemistry exists throughout the water seasonally and vertically in summer. During warm months a thermocline exists together with relatively strong chemoclines of O2, CO2, alkalinity, conductivity and other components of the water. Winter phytoplankton populations are sparse but increase in density in spring. Zooplankton, mostly rotifers and copepod larvae, is likewise meager in winter but increases in summer. The absence of Cladocera and adult Copepoda during the day in the water is an interesting feature of the lake. Zoobenthic forms consist mainly of the dipterans Chaoborus sp. and Tendipes sp. together with calanoid and cyclopoid copepods. Chlorophyll a varies seasonally and in vertical aspect.--Copyright 1972, Biological Abstracts, Inc.
W72-07253

A STUDY ON THE BALANCE OF CHLORINE OVER THE DRAINAGE AREA OF LAKE ONUMA IN OSHIMA PENINSULA, HOKKAIDO (IN JAPANESE),
Research Inst. for Natural Resources, Tokyo (Japan).
For primary bibliographic entry see Field 02H.
W72-07255

GENERAL HYDROBIOLOGY WITH PARTICULAR APPLICATION TO SCHISTOSOMA VECTORS. HYPEREUTROPHY, A MODERN PROBLEM OF BODIES OF WATER,
Instituto Oswaldo Cruz, Rio de Janeiro (Brazil).
P. H. Lejeune DeOliveira, and Luiza Krau.
Mem Inst Oswaldo Cruz. 68 (1): 89-118. 1970. English summary.
Identifiers: Algae, Blue-green, Eutrophication, Eutrophy, Human, Hydrobiology, Mollusks, Planorbidae, Schistosoma, Vectors.

The influence of man on the eutrophication of Lago de Brasilia, a lake in Brasilia, is presented. Mineral nutrients have increased and stimulated the growth and blooms of blue-green algae. The threat of growing populations of Planorbidae mollusks as vectors of schistosomiasis is another aspect in the increased eutrophication index of the lake.--Copyright 1972, Biological Abstracts, Inc.
W72-07256

BACTERIAL FLORA OF PHYTO- AND ZOO--PLANKTON IN THE INSHORE WATER OF JAPAN,
Chiba Univ. (Japan). Inst. of Food Microbiology.
U. Simidu, K. Ashino, and E. Kaneko.
Can J Microbiol. 17 (9): 1157-1160. 1971. Maps.
Identifiers: Aeromonas, Association, Bacterial, Flora, Inshore, Japan, Marine, Organism, Phyto, Plankton, Vibrio.

Generic composition of aerobic bacterial flora of plankton was compared with that of seawater. More than 70% of the heterotrophic bacteria from most of the plankton samples were Vibrio and Aeromonas, while the percentage of occurrence of these genera in the seawater flora was about 45%. The assumption that some Vibrio and Aeromonas are closely associated with marine organisms was discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-07265

SURVIVAL AND HATCHING OF WHITE SUCKER EGGS AT VARIOUS DISSOLVED OXYGEN LEVELS,
Minnesota Univ., St. Paul. Dept. of Entomology.
Donavon M. Oseid, and Lloyd L. Smith, Jr.
Progr Fish Cult. 33 (3): 158-159. 1971.
Identifiers: Catostomus-Commersonnii, Dissolved, Eggs, Hatching, Oxygen, Sucker, Survival.

In 1966, white sucker eggs (Catostomus commersonnii) were subjected to dissolved O2 (DO) levels of 3, 5, and 7 ppm at 12.3 degrees C. Hatch was completed in 15 days and 14 days were required for 95% hatch at all levels. Sucker eggs in 1967 were incubated at 3 and 6 ppm DO and at 12.9 degrees C and required 15 and 13 days respectively to complete hatch. Completion of 95% hatch was attained in 13 and 11 days. Survival ranged from 19.9 to 28.5% in 1967 with the lower survival at the higher O2 concentration. In 1966 survival ranged from 18.3 to 24.2%. The mean length of suckers at time of hatching was 0.4 to 0.6 mm (4.1 to 7.2%) smaller at low than at high O2 levels.--Copyright 1972, Biological Abstracts, Inc.
W72-07275

5D. Waste Treatment Processes

COSTS OF TREATING TEXTILE WASTES IN INDUSTRIAL AND MUNICIPAL TREATMENT PLANTS: SIX CASE STUDIES,
Clemson Univ., S.C. Water Resources Research Inst.
M. B. Richardson, and J. M. Stepp.
Available from the National Technical Information Service as PB-208 021, $3.00 in paper copy, $0.95 in microfiche. South Carolina Water Resources Research Institute, Clemson, Report No. 27, March 1972. 64 p, 13 tab, 47 ref. OWRR A-017-SC (5).

Descriptors: Textiles, *Waste water treatment, *Average costs, *Cost comparison, *Industrial wastes, *Treatment facilities, Liquid wastes, Municipal wastes, Costs, Economics, Benefits.
Identifiers: *Textile wastes, Industrial and municipal treatment plants, Wet-process textile manufacturing plants.

Data on operations and costs of manufacturing as well as wastewater treatment were obtained from 6 textile mills which employed 9,150 workers and treated approximately 5.9 billion gallons of wastewater in 1968, and on the operations of 26 municipal sewage plants which in 1967 treated the liquid wastes of 98 textile mills. Eleven of the municipalities provided cost data that were comparable with the data obtained from the industrial firms. Treatment costs per unit of wastewater were quite high for 2 firms which had very small volumes of wastewater, but in no case did treatment costs amount to as much as one percent of total manufacturing costs. Measured in 1969 prices, costs of treating textile wastes in 11 municipal facilities ranged from 10.05 to 53.54 cents per 1,000 gallons. The comparable range in the 6 industrial facilities was from 2.4 cents to $12.28. However, the unit costs of 3 of the 6 industrial facilities were below 10 cents per 1,000 gallons, and the unit costs of another were lower than those of 9 of the 11 municipalities used as the basis for comparison. Technical and institutional problems associated with treatment of industrial wastes in municipal facilities are also discussed.
W72-06601

FACTORS REGULATING THE GROWTH OF ALGAE IN CONTINUOUS CULTURE IN DILUTED SECONDARY SEWAGE TREATMENT PLANT EFFLUENT AND SUBSEQUENT BIODEGRADABILITY,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 05C.
W72-06612

SURVEY OF ALTERNATE METHODS FOR COOLING CONDENSER DISCHARGE WATER--OPERATING CHARACTERISTICS AND DESIGN CRITERIA.
Dynatech Corp., Cambridge, Mass.

Available from the National Technical Information Service as PB-208 035, $0.95 in microfiche. Environmental Protection Agency-Water Quality Office, Water Pollution Control Research Series, August 1970, 94 p, 30 fig, 15 tab, 139 ref. EPA Program 16130 DHS 08/70.

Descriptors: *Electric power production, *Thermal power plants, *Nuclear power plants, Heated water, Fuels, Operating costs, Maintenance cost, Heat exchangers, *Thermal pollution, *Design criteria, Waste water treatment.
Identifiers: *Boiler plant, Steam turbines, Steam condensers, Fixed charge rate.

This report is part of a larger study to perform a technical and economic survey of alternate methods for cooling condenser discharge water from thermal power plants. The criteria by which the power plants themselves are designed and optimized are described. These criteria are both technological and economic. The general aspects of power plant selection are reviewed. These include questions such as how the procedure of procuring a new plant is initiated, how the plant size is determined, what factors influence the choice of fuel and site location, and how the plant capacity factor and fixed charge rate are calculated. Design and cost optimization procedures are reviewed. This includes capital costs for the turbine-generator units and for the boilers. Operating costs are computed based on constant incremental running rates. An example is carried to the point of a 'present worth' evaluation. The use of feedwater heaters, and single- and multi-pressure condensers is described. Some operational considerations including instrumentation and control and plant layout are discussed briefly. (See also W72-06617)
W72-06616

A SURVEY OF ALTERNATE METHODS FOR COOLING CONDENSER DISCHARGE WATER--LARGE-SCALE HEAT REJECTION EQUIPMENT.
Dynatech Corp., Cambridge, Mass.

Available from the National Technical Information Service as PB-208 036, $0.95 in microfiche. Environmental Protection Agency-Water Quality Office, Water Pollution Control Research Series, July 1969, 127 p, 31 fig, 8 tab, 86 ref. FWQA Project 16130 DHS 07/69, Contract 14-12-477.

Descriptors: *Thermal power plants, *Cooling towers, *Heat transfer, *Thermal pollution, Waste water treatment, Heated water.
Identifiers: *Cooling ponds, *Evaporation condensers, *Heat rejection equipment.

Various types of heat transfer equipment which would be applicable to the task of dissipating condenser discharge heat from large power plants are identified. Their performance is analyzed, performance prediction methods are presented, and the capital and operating costs are given. The basic thermodynamics of the Rankine power cycle are reviewed in order to provide some basis for understanding the effect of the heat rejection process on the total cycle. Information including sizing procedures, capital and operating cost, duty maintenance requirements, and possible secondary pollution considerations are presented for candidate systems such as once-through cooling (to serve as a base), cooling ponds, spray ponds, wet cooling towers, dry cooling towers, evaporation condensers, and air-cooled condensers. Operational considerations are discussed including the theory of operation at the design point, off-design performance, running procedures, and any unusual characteristics affecting the interface between the cooling system and the power plant. The material describing each of the individual units is integrated and procedures and criteria are developed for the selection of an optimum unit given a particular geographic location, capacity requirements, and economic constraints. (See also W72-06616)
W72-06617

EFFLUENT TREATMENT PROCESSES,
Gulf States Paper Corp., Tuscaloosa, Ala. (Assignee).
Robert R. Fuller.
U. S. Patent No. 3,627,679, 6 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office Vol. 893, No 2, p 689, December 14, 1971.

Descriptors: *Patents, *Pulp wastes, Waste treatment, Sludge, Liquid wastes, *Pulp and paper industry, *Waste water treatment, *Pollution abatement, *Water pollution control, Mechanical equipment, Biochemical oxygen demand, Industrial wastes.
Identifiers: Alum mud, Color precipitation, Chemical treatment.

The procedure involves admixing a predetermined quantity of color precipitating reagent to the waste effluent stream (from pulp and paper mills). This is followed by separation of the precipitate from the decolorized effluents. The precipitated color bodies and sludge is further dewatered. Some of the dewatered precipitate is calcined to an inorganic ash, and the ash is treated to regenerate the precipitating reagent for subsequent use on fresh effluent. (Sinha-OEIS)
W72-06619

WASTEWATER CONCENTRATION METHOD,
Sweco, Inc., Los Angeles, Calif. (Assignee).
Walter J. Talley, Jr., and Howard W. Wright, Jr.
U. S. Patent No. 3,627,130, 6 p, 9 fig, 2 tab, 4 ref; Official Gazette of the United States Patent Office Vol. 893, No. 2, p 562, December 14, 1971.

Descriptors: *Patents, Methodology, *Screens, Sewers, *Storm runoff, Waste treatment, *Waste water treatment, *Water pollution control, *Pollution abatement, Separation techniques, Mechanical equipment.
Identifiers: *Screening apparatus.

The screening apparatus consists of a cylindrical rotary screen device disposed for rotation within a housing. Means are provided to direct an influent toward the inner surface of the screen. Means are also provided for receiving the effluent, the concentrate and the backsplash. The apparatus is intended for fine-mesh screening for primary treatment of storm water overflow from combined sewer systems. (Sinha-OEIS)
W72-06621

SEWAGE TREATMENT APPARATUS AND METHOD,
Del-Pak Media Corp. (Assignee).
John Hay.

U. S. Patent No. 3,496,101, 4 p, 7 fig, 4 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 3, p 899, February 17, 1970.

Descriptors: *Patents, *Sewage treatment, *Liquid wastes, *Biological treatment, *Aeration, *Flocculation, Filters, *Filtration, Waste treatment, *Waste water treatment, Water pollution control, Pollution abatement, Mechanical equipment, Biochemical oxygen demand.

This apparatus is constructed as a grid-like array of horizontally and vertically spaced members providing upwardly and downwardly facing, horizontally disposed, roughened surfaces over which liquid sewage will trickle slowly. The sewage is affected by gravity and remains in contact with biological slimes and simultaneously is exposed to oxygen for a favorable time. The maximum filter capacity and rate of purification will be attained when the biological slimes have coated each member completely and to the maximum depth consistent with growth and cleavage characteristics of the slimes. The apparatus can withstand much higher BOD loads than other devices. Excessive growth of the slimes is shed in the form of flocculents. The flocculents may fall and be transported by a continuous waste fluid flow to the vertical passages. (Sinha-OEIS)
W72-06623

SYSTEM FOR TREATING SEWAGE WATER USING FLOCCULATION,
Stenberg-Flygt A.B., Solna (Sweden). (Assignee).
Sixten Englesson, and Sven Gustaf Yngve Gamer.
U. S. Patent No. 3,495,711, 4 p, 2 fig, 6 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 3, p 807, February 17, 1970.

Descriptors: *Patents, *Sewage treatment, *Flocculation, *Aeration, Sedimentation, *Waste water treatment, Water pollution treatment, Hydraulic equipment, Pollution abatement.

This system includes a buffer or equalizing chamber, a flocculating chamber, a sedimentation chamber and a regenerating chamber. All are arranged in an integrated array within a cylindrical casing. A third of the sludge is removed each day along with a portion of newly arrived sludge and usually introduced into a digester where the aerobic sequence is interrupted and replaced by an anaerobic process. About 2/3 of the BOD departs in the form of CH2 and CO2. Albumin is decomposed partly to ammoniac or ammonium bicarbonate. Phosporous is converted to HPO4 ions. (Sinha-OEIS)
W72-06624

WASTE DISPOSAL SYSTEM,
Joseph Almont Carlani, Jr.
U. S. Patent No. 3,497,062, 2 p, 4 fig, 6 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 4, p 1150, February 24, 1970.

Descriptors: *Patents, *Waste treatment, Waste water treatment, *Water purification, *Waste disposal, Sewage disposal, *Sewage treatment, Water pollution control, Pollution abatement, Air pollution, *Domestic wastes, Mechanical equipment, Settling basins.

This domestic waste disposal system provides for soaking, then grinding or mulching the waste to produce a slurry of pulverant waste and water. The slurry is conducted through a conduit to a settling pond where the water is drained off and pumped back to the soaking pits after being purified in a water purification plant. The purified water can then be re-used or returned to its original source. (Sinha-OEIS)
W72-06625

METHOD OF AND APPARATUS FOR FILTERING,
Hydromation Engineering Co., Livonia, Mich. (Assignee).
Gene Hirs.
U. S. Patent No. 3,497,063, 5 p, 5 fig, 3 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 4, p 1150, February 24, 1970.

Descriptors: *Patents, *Filters, *Filtration, Waste treatment, *Waste water treatment, Water pollution control, Pollution abatement, Mechanical equipment.

Filtration is accomplished by passing contaminated liquid through a filter medium. Contaminants are trapped in voids of the filter while clean liquid is withdrawn. The filter chamber is provided with a movable support structure which is an endless belt having apertures and a run extending through the filter chamber. (Sinha-OEIS)
W72-06626

AEROBIC WASTE SYSTEM WITH PNEUMATIC EJECTION AND CHLORINATION,
Water Pollution Controls, Inc. (Assignee).
Joe M. Valdespino.
U. S. Patent No. 3,497,064, 3 p, 2 fig, 5 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 4, p 1150, February 24, 1970.

Descriptors: *Patents, *Chlorination, *Waste water treatment, *Aeration, Water pollution treatment, Filtration, Skimming, Mechanical equipment, Hydraulic design, Waste treatment, Settling basins.

In this waste treatment system air is introduced through a venturi directly into a solid waste material. Aeration occurs in a vacuum tank. Preaeration occurs in combination with hydraulic comminution. Waste material is chlorinated in measured batches and forcibly ejected by pneumatic pressure. A settling tank is surrounded by the hydraulic comminutor and has a filtering screen to filter the outflow and a skimmer operated by venturi vacuum to skim the settling tank. (Sinha-OEIS)
W72-06627

PLANTS FOR THE TREATMENT OF SEWAGE,
Drysdale and Co. Ltd., Glasgow (Scotland). (Assignee).
Hames B. Nicol.
U. S. Patent No. 3,497,066, 2 p, 6 fig, 3 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 4, p 1151, February 24, 1970.

Descriptors: *Patents, *Sewage treatment, *Aeration, *Waste water treatment, Water pollution control, Water purification, Separation techniques, Mechanical equipment. Weirs.

The sewage treatment plant employs the contact stabilization process. It consists of a sewage-receiving and aerating compartment and two treatment compartments. Air is introduced at a point below the normal liquid level. Fluid is transferred by airlift from one compartment to another. The discharge from the treatment compartments may be by way of weirs over which the treated sewage flows when the level rises to the appropriate height. (Sinha-OEIS)
W72-06628

BLENDED GRANULAR BEDS FOR WATER AND WASTEWATER FILTERS,
A. Adler Hirsch.
U. S. Patent No. 3,497,068, 6 p, 9 fig, 1 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 4, p 1151, February 24, 1970.

Descriptors: *Patents, *Waste water treatment, *Filtration, *Filters, Sands, Water quality control, Water pollution treatment, Water purification, Separation techniques, Water supply.

A theoretical discussion deals with the effect of wash water troughs, the fundamental defects in mixing media by backwash, and the blended zone bed. Fine and coarse granular material is blended before placement and laid in shallow laminae in downflow filters so that average grain, hence pore size, varies continuously, decreasing with depth. Hydrodynamic stability is established by using materials having equal degrees of expansion at the upflow rate intended. A homogeneous roughing layer of the larger component may overlay the graded blend; a final polishing layer consisting of the finer component may be on the bottom. For particular needs, more than one such blended zone may be formed with additional materials. In upflow filters grading order is reversed. No interfaces exist between zones. The approximate thicknesses of the zones are indicated. (Sinha-OEIS)
W72-06629

OIL RECYCLING,
Congress, Washington, D.C.; and House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-06635

NEW PLANNING HORIZONS FOR THE BUREAU OF RECLAMATION,
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 06B.
W72-06752

DISPOSAL OF WATER WORKS WASTES,
American Water Works Association Research Foundation, New York.
H. A. Faber, and A. D. Nardozzi.
Paper presented at Iowa Section American Water Works Association, Des Moines, Iowa, October 28, 1971. 29 p, 8 tab, 30 ref.

Descriptors: *Sludge treatment, *Sludge disposal, Dewatering, Lagoons, Freezing, Regulation, Waste disposal, Iowa, Sludge, Lime, Magnesium carbonate, Waste treatment, Drying, *Wastewater treatment.
Identifiers: *Research needs, Calcination, Alum recovery, Filter washwater, Magnesium carbonate recovery, Filter pressing, Vacuum filtration, Polymer evaluation, Polyelectrolytes.

Treatment alternatives to process lime-soda and alum sludge and filter washwater were reviewed. Waste discharge regulations for Iowa and the nation were compared. Purification and softening waste treatment processes discussed include: settling or lagooning; drying beds; freezing; lime recovery; alum recovery; filter pressing; and chemical coagulation. Developmental studies include the evaluation of magnesium carbonate as a recycled coagulant at purification plants, and the effectiveness of polyelectrolytes as primary coagulants, coagulant aids, and sludge conditioning agents to reduce waste volume and improve sludge dewaterability. Research needs are development of uniform reports on sampling, analysis, and waste categorization; investigation and application of new or modified physical and chemical liquid-solids separation processes; and more detailed investigation of by-product recovery technology in areas where land disposal is uneconomical. Demonstration is required on the utility of polymers, filter washwater recycling, and solid waste recovery for reuse or marketing. (Nardozzi-AWWARF)
W72-06816

DISPOSAL OF WATER TREATMENT PLANT WASTES.
American Water Works Association, New York.

Report of the Water Quality Division Committee on Disposal of Water Treatment Plant Wastes, 1971. 31 p, 2 tab, 4 fig, 22 ref.

Descriptors: *Sludge treatment, Dewatering, Byproducts, Ultimate disposal, Waste disposal, Waste treatment, Sludge, Lime, *Sludge disposal, Waste water treatment.

Identifiers: *Waste volume minimization, Alum sludge, Filter washwater, Polymers, Standardized methods, Research needs.

Reclamation, handling, and disposal procedures for common water treatment wastes are reviewed. Areas requiring further research are recommended. Waste discharges to watercourses will be limited by strict pollution control legislation. Approaches to disposal problems include incorporating waste disposal processes into new water treatment plant designs, minimization of waste volumes, water reuse, by-product recovery, and exploration of new ultimate disposal methods. Thickening, centrifugation, vacuum filtration, filter pressing, and lagooning procedures dewater lime-soda sludges. Lime can be recalcined when magnesium hydroxide is separated from this sludge. A flow diagram for magnesium carbonate is presented. A modified alum recovery process, in which a filter press separates recovered alum solution from insoluble residue is illustrated. Filter backwash recycling is discussed. Lagoon size is governed by liquid sludge volume, dry solids production and sludge compaction, local evaporation rates, and cleaning frequency. Future research recommendations include: developing standard methods for sampling, analyzing, and categorizing wastes; waste quantity minimization procedures; chemical and water recovery; waste quantity and character improvement through polymer utilization; and new disposal techniques. (Nardozzi-AWWARF)
W72-06817

POTATO STARCH AS A SLUDGE CONDITIONER,
Gainesville Water and Sewage Dept., Fla.
R. P. Vogh, J. E. Warrington, and A. P. Black.
Journal American Water Works Association, Vol 61, No. 6, p 276-284, June 1969. 6 fig, 5 tab.

Descriptors: *Flocculation, Water softening, Florida, Treatment facilities, Sludge, Compaction, *Sludge treatment, *Waste treatment, Activated sludge, Cost comparisons, Laboratory equipment, Laboratory tests.
Identifiers: *Potato starch, Torque, Jar tests, Barrel tests, Gainsville (Fla).

Activated silica was used as a flocculant aid to settle softening precipitates at a Florida water treatment plant. Activated silica conpacted the sludge to a resistance where torque complications made reactor operation difficult. Jar tests were run using alum, ferric sulfate, cold water starch, anionic polymer, cationic polymer, carboxymethyl cellulose, lignosulfonate, and magnesium sulfate. Cold swelling potato starch proved effective and economical in barrel tests conducted on 55 gallon water samples. Sludge conditioned by potato starch occupied 50% of the settled volume of activated silica sludge. A more turbid water entered the filter from the starch treatment, but did not decrease filter runs. Potato starch eliminated torque problems in the plant. A 1% feed solution is used. A delivery system is detailed. Potato starch is cheaper than activated silica for Gainesville. An instrument is illustrated and method described to evaluate potential torque considerations. The action of potato starch is described in producing a mobile and soft sludge. (Nardozzi-AWWARF)
W72-06819

SELECTION OF DISPOSAL METHODS FOR WATER TREATMENT PLANT WASTES,
Black and Veatch, Kansas City, Mo.
D. P. Proudfit.
Journal American Water Works Association, Vol 60, No 6, p 674-680, June 1968. 1 tab, 9 ref.

Descriptors: *Sludge treatment, Lagoons, *Waste disposal, Settling basins, *Treatment facilities, Water reuse, Landfills, Drying, Sludge, Lime, Calcium compounds, *Waste treatment, *Recycling, *Waste water treatment.
Identifiers: *Recalcining, Sand drying beds, Backwash water, Recarbonation, Colorado Springs (Colo), St. Paul (Minn), Minneapolis (Minn).

Sludge treatment facilities at three water utilities are described. In Colorado Springs, Plant 1 treated raw water of 8 turbidity units and 100 ppm TDS with alum, soda ash, and chlorine. A wastewater recovery basin was built to retain sedimentation sludge and filter washwater. Plant 2 treating a less turbid water, constructed recovery basins. Plant 3 recaptured supernatant from sludge and backwash water settling. Solids were processed on drying beds for landfill. St. Paul decided on recalcining lime and recovering filter washwater at the softening plant. Mg (OH)2 was separated from CaCO3 by carbonation and centrifugal classification. Waste solids are put in lagoons. The CO2 from recalcining is used for chemical stabilization of the finished water and sludge recarbonation. Washwater is recycled to the sedimentation basins. Expected yearly results were: 9800 tons 92% CaO; 330 tons excess CaO for sale; 9950 tons CO2; 170 million gallons washwater recovered; sludge volume for disposal reduced by 83%; and reduced load to sewage treatment. In Minneapolis the waste plan included alum regineration, lime recalcining, CO2 recovery, magnesium recovery, and hydrochloric acid production. Each handling problem is unique. No universal solutions presently are available. (Nardozzi-AWWARF)
W72-06820

LAGOON DISPOSAL OF LIME SLUDGE,
Alvord, Burdick and Howson, Chicago, Ill.
L. R. Howson.
Journal American Water Works Association, Vol 53, No 9, p 1169-1173, September 1961. 1 fig, 1 tab, 2 ref.

Descriptors: *Lagoons, Storage capacity, Moisture content, *Sludge disposal, Drying, Costs, Waste disposal, *Waste storage, *Sludge, Lime.
Identifiers: *Lime sludge, Decantation.

Variables to be considered in the design of lime sludge lagoons were evaluated. One case showed that lime sludge discharged to a sewage treatment plant accumulated in the Imhoff tanks and affected plant efficiency and capacity to handle sewage wastes. Softening wastes vary in character and density. Volume is inversely proportional to the solids concentration. Lagoon storage capacity is influenced by sludge volume, continuous or intermittent operation, supernatant decantation, and air drying. Cost data are presented for pumping lime sludge for pumping lime sludge in asbestos-lined cement pipe. Pumping sludge to lagoons is an economical treatment where land is available. A 50% moisture content can be achieved in well operated multiple lagoons with decantation facilities and air drying. Sludge volumes can be reduced to 16% of original volume. A loading rate of 0.5-1.0 acre-ft/yr/mgd/100ppm hardness removed is suggested to reach a 50% moisture content in one year. Multiple lagoons, at least three, must be operated on a fill and let dry basis with filling at one end and decantation at the other. The water level should be low to facilitate sludge compaction. (Nardozzi-AWWARF)
W72-06821

RECLAIMING WATER FROM WATER PLANT SLUDGE,
Lompoc Water Utility, Calif.
E. Scolari.
Public Works, Vol 99, No. 6, June 1968. p 100.

Descriptors: *Water reuse, Sludge disposal, *Costs, Sludge, Recycling, Treatment facilities, Water treatment.
Identifiers: *Drying beds, Receiving well.

The recovery of supernatant from sludge drying beds produced a treated water cost savings. Water treatment included lime-soda softening, clarification, recarbonation, and vacuum type diatomite filtration. Some sludge is recirculated. The highly treated sludge supernatant is reclaimed rather than discharged to the sewer system. An asbestos-cement lined pipe intercepted decanted water and returned it to receiving wells by gravity flow. Pumps, automatically operated by float switches, returned this water to the flocculating section of the treatment facilities. Final installed costs were less than $6526. The first year the plant reclaimed 36 mgd of water with a treated water value of $8394. Second year recovery exceeded 43 mgd with a treated water value of $10,563. (Nardozzi-AWWARF)
W72-06822

SLUDGE REMOVAL AND DISPOSAL,
Miami Dept. of Water and Sewers, Fla.
C. F. Wertz.
Special Subject No. 9, International Water Supply Congress and Exhibition, Stockholm, Sweden, June 15-19, 1964. 14 p, 3 tab, 13 ref.

Descriptors: *Sludge disposal, Lagoons, *Sludge treatment, Surveys, *Waste disposal, *Sludge, *Waste treatment, Magnesium hydroxide.
Identifiers: Recalcining, Alum recovery, Discharge to watercourses, Thickening.

Water treatment plant sludge disposal methods are reviewed and each technique is referenced to individual water utilities. Purification and softening waste characteristics are discussed. Sludge production is related to the physical character of the solid material and the percent solids in the wet sludge. Pilot testing on raw water is recommended to determine the amount and type of sludge for lagooning or recalcining. The 48 State Sanitary Engineers were surveyed. They reported disposal by discharge to watercourses, lagooning, thickening, recalcining, and alum recovery. Data are provided at different facilities for each operation. Magnesium hydroxide can be eliminated from softening waste prior to calcining by carbonation or selective softening procedures. Conclusions are: discharges to watercourses would be discontinued; lagoons and drying beds require careful design; supernatant must be withdrawn from lagoons; and a method to separate turbidity from CaCO3 sludge must be developed before some utilities can use recalcining. (Nardozzi-AWWARF)
W72-06823

SUPPLEMENTARY AERATION OF LAGOONS IN RIGOROUS CLIMATE AREAS,
Wyoming Univ., Laramie. Dept. of Civil Engineering.
R. L. Champlin.
Copy available from GPO Sup Doc as EP2.10:17050 DVO-10/71, $0.75; microfiche from NTIS as PB-208 204, $0.95.Environmental Protection Agency Water Pollution Control Research Series, October 1971, 73 p. 24 fig, 15 tab, 7 ref. EPA Program 17050DVO--10/71.

Descriptors: *On-site investigation, *Cold regions, *Oxidation lagoons, Organic loading, Aeration, Mixing, Algae, Temperature, Altitude, Climates, Metabolism, Biochemical oxygen demand, Pilot plants, *Waste water treatment, Wyoming, *Aerated lagoons.

A pilot scale field investigation of the effects of supplemental aeration on waste stabilization lagoons was conducted at Laramie, Wyoming, a low temperature, high altitude area. Both batch and complete mixed experiments were conducted using constant air flows. Loading rates, both hydraulic and process , were varied from 160 lbs BOD5/acre/day (0.725 lbs/1000 ft3/day) to 900 lbs BOD5/acre/day (4.08 lbs/1000 ft3/day). The supplemental aeration provided both aeration and mixing, thereby increasing metabolic rates. BOD reductions varied from 72 to 85% under three different loadings, at temperatures of less than 12 deg

C. Loading below 320 lbs/acre/day and secondary cell operation produced significant algal growth even at temperatures around 6 deg C. No settleable solids were found in the effluent from the aerated system. Series operation was demonstrated to have the advantages of damping variations in quality parameters, providing for shock loading, and reducing coliform counts to minimum levels. Shorter detention periods also take greater advantage of the warmer influent temperatures in order to satisfy easily oxidized organic material. (Lowry-Texas)
W72-06838

OPTIMIZATION OF THE REGENERATION PROCEDURE FOR GRANULAR ACTIVATED CARBON.
MSA Research Corp., Evans City, Pa.

Copy available from GPO Sup Doc as EP2.10:17020 DAO--07/70, $1.25; microfiche from NTIS as PB-208 205, $0.95. Environmental Protection Agency Water Pollution Control Research Series, July 1970. 115 p, 20 fig, 41 tab, 5 ref. EPA Program 17020 DAO--07/70. Contract 14-12-107.

Descriptors: *Activated carbon, *Adsorption, *Separation techniques, Chemical reactions, Catalysts, Oxidation, Metals, Leaching, Steam, *Waste water treatment, *Optimization.
Identifiers: *Thermal regeneration, *Chemical regeneration, *Adsorptive capacity, Pyrolysis.

Laboratory scale experiments were conducted on the regeneration of activated carbons spent in tertiary treatment of wastewater. Wet spent carbon being regenerated thermally undergoes three regeneration stages: (1) drying at about 220 deg F; (2) pyrolysis of the adsorbed pollutants at 500 to 1550 deg F; and (3) activation with flue gas and steam at 1600 to 1700 deg F. Data indicated that alkaline and iron oxide ash accumulation catalyze the oxidation of carbon pores in the 18 A to 28 A diameter range, the pores most effective in pollutant adsorption. Leaching with HCl was found to remove the metallic elements and allow regeneration to proceed with less destruction of the carbon. Other observations included: (1) steam as activating gas is more efficient than CO2 in recovery of the initial properties of the carbon; (2) slow drying of the wet carbon is more effective than fast drying; (3) the true loss of 1.8% of the carbon volume in thermal regeneration appears to proceed by generation of sub micron-sized fines rather than carbon oxidation; and (4) attempted chemical regeneration without heat was ineffective and/or uneconomical. (Lowry-Texas)
W72-06839

PILOT PLANT INSTALLATION FOR FUNGAL TREATMENT OF VEGETABLE CANNING WASTES.
Green Giant Co., LeSueur, Minn.

Copy available from GPO Sup Doc as EP2:10:12060 EDZ--08/71, $1.00; microfiche from NTIS as PB-208 206, $0.95. Environmental Protection Agency Water Pollution Control Research Series, August 1971. 77 p, 36 fig, 7 tab, 7 ref. EPA Program 12060 EDZ--08/71.

Descriptors: *Canneries, *Industrial wastes, *Sweet corn, Fungi, Fermentation, Aeration, Hydrogen ion concentration, Protein, Nitrogen, Phosphates, *Pilot plants, Research and development, Efficiencies, Separation techniques, Screens, Filtration, Cost analysis, *Waste water treatment.
Identifiers: *Oxidation ditch, *Aerated lagoon, *Mycelium.

A pool unit with a 2 hp surface aerator and an oxidation ditch with a 3 ft rotary brush aerator, both containing the imperfect fungus, Trichoderma viride, were compared with a conventional aerated lagoon for efficiency in treating corn and pea wastes. With pH controlled at 3.7, ammonium nitrogen and inorganic phosphate were added, and the resultant residence time in the fungal systems was 20 hours. In the fungal systems, BOD5, COD, and TOC were reduced 96%, 88%, and 93% respectively for corn wastes and 95%, 81% and 87% respectively for pea wastes. Essentially zero levels of ammonia nitrogen and inorganic phosphate could be obtained, while organic phosphate removal averaged 80%, 50% of the BOD5 was converted to mycelium, of which the dry weight protein content was 50%. The best recovery system was a vibrating screen for bulk harvest and a sand filter for smaller particles. Direct costs of 4.9 cents/lb BOD5 could be reduced to: (1) 3.1 cents/lb by selling the mycelium as feed, (2) 1.1 cents/lb by operating year round and selling the mycelium, and (3) 0.8 cents/lb by feeding the mycelium direct with no drying. (Lowry-Texas)
W72-06840

PHOSPHORUS REMOVAL BY FERROUS IRON AND LIME,
Rand Development Corp., Cleveland, Ohio.
E. Thomas Alvord, Dennis M. Gaughan, Clyde M. Marr, Thomas Colpetzer, and Dudley B. Rose.
Copy available from GPO Sup Doc as EP2:10:11010 EGO--01/71, $0.75; microfiche from NTIS as PB-208 208, $0.95. Environmental Protection Agency Water Pollution Control Research Series, January 1971. 71 p, 13 fig, 18 tab, 32 ref. EPA Program 11010 EGO--01/71.

Descriptors: *Municipal wastes, *Phosphorus, *Chemical precipitation, *Iron, *Lime, Sludge, Acids, Separation techniques, Cost analysis, Flocculation, Anaerobic digestion, *Waste water treatment.
Identifiers: *Waste pickle liquor, *Suspended solids.

Spent pickle liquor, as a source of ferric ion, was added to primary treatment facilities and found to be effective in removing more than 60% of the phosphorus contained in the sewage. When advanced means for more complete removal of the insolubilized phosphates are available, removals in excess of 90% are indicated. In addition, overall suspended solids removals averaged 61.5% and BOD and COD removals averaged 61.6 and 55.3 percent during a 23 month test period. Required iron dosage ranged from the theoretical minimum of 2.7 to a maximum of approximately 3.1 weights of ferrous iron per weight of phosphorus. The weight increase in sludge solids due to chemical precipitation of phosphorus was 100 lbs/million gallons/mg/liter of phosphorus in the influent. Enhanced suspended solids removals represented an additional 420 lbs/mg. Total costs for treating a raw sewage containing 13 mg/l phosphorus, as typically received during this work, were estimated at $14.17 per million gallons. (Lowry-Texas)
W72-06841

DRY CAUSTIC PEELING OF TREE FRUIT FOR LIQUID WASTE REDUCTIONS.
National Canners Association, Berkeley, Calif. Western Research Lab.

Copy available from GPO Sup Doc as EP2:10:12060 FQE--12/71, $0.60; microfiche from NTIS as PB-208 209, $0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1970. 52 p, 15 fig, 10 tab, 11 ref. EPA Program 12060 FQE--12/70.

Descriptors: *Fruit crops, *Canneries, *Industrial wastes, Laboratory tests, Water utilization, Peaches, Chemical oxygen demand, Water quality control, *Waste water treatment.
Identifiers: *Dry caustic peeling, *Waste reduction, Apricots, Pears, Suspended solids.

Laboratory scale experiments in a 2 ton/hour experimental unit with peaches, pears, and apricots demonstrated that peel softened by hot solutions of sodium hydroxide can be removed efficiently by a series of rotating rubber discs. The quality of the peeled fruit prepared with the experimental unit compared favorably with fruit peeled in the conventional manner by commercial equipment, while peeling losses for all three fruits in the experimental unit were the same or slightly lower than those resulting from commercial peeling. During experimental peeling of peach halves, volume of wastewater discharged was 34.5 gallons per ton of pitted peaches as compared to 547 gallons per ton for conventional commercial peeling. The commercial process also discharged 59.5 lb COD and 10.4 lb of suspended solids, as compared to 18.1 lb COD and 3.0 lb SS for the experimental unit. The volume of fresh water needed for the experimental process was also 93% less than that used in commercial peelers. Future plans include construction and operation of a 10 ton/day experimental unit to confirm and extend these limited results, as well as obtaining further results for pears and apricots. (Lowry-Texas)
W72-06842

AN INVESTIGATION OF TECHNIQUES FOR REMOVAL OF CYANIDE FROM ELECTROPLATING WASTES.
Battelle Columbus Labs., Ohio.

Copy available from GPO Sup Doc as EP2:10:12010 EIE--11/71, $1.00; microfiche from NTIS as PB-208 210, $0.95. Environmental Protection Agency Water Pollution Control Research Series, November 1971. 87 p, 15 fig, 31 tab. EPA Program 12010 EIE--11/71.

Descriptors: *Activated carbon, *Adsorption, *Separation techniques, Heavy metals, Surveys, Copper, Toxicity, Industrial wastes, Pilot plants, Operation and maintenance, Cost analysis, *Waste water treatment.
Identifiers: *Cyanides, *Metal finishing, *Plating, Cadmium.

Increasingly stringent stream discharge regulations have prompted an assessment of the current technology available for application to the metal finishing waste treatment problem, specifically in regard to smaller operations. 655 questionnaires were sent to various metal finishing plants, and 50 firms were requested to send samples of the various effluents for analysis. Experimental laboratory and bench scale studies were then conducted on several unconventional wastewater treatment methods, including ion flotation, activated carbon adsorption, acidification volatilization, and solvent extraction. A demonstration pilot plant study was also conducted on the activated carbon process employing actual rinse waters from a zinc cyanide plating operation. The pilot scale activated carbon system was operated at 99% efficiency of cyanide removal, while providing for the complete recovery and regeneration of copper. Cost estimates for both a manual and a semi-continuous carbon sorption process for removing cyanides from cadmium and copper as well as zinc plating rinse waters were formulated for capital, chemical, and net operating costs for a plant treating 10 gpm of wastewater containing 30 ppm of cyanide. (Lowry-Texas)
W72-06843

ULTRATHIN MEMBRANES FOR TREATING METAL FINISHING EFFLUENTS BY REVERSE OSMOSIS.
North Star Research and Development Inst., Minneapolis, Minn.

Copy available from GPO Sup Doc, $1.00; microfiche from NTIS as PB-208 211, $0.95. Environmental Protection Agency Water Pollution Control Research Series, November 1971. 92 p, 15 fig, 19 tab, 24 ref. EPA Program 12010 DRH--11/71.

Descriptors: *Reverse osmosis, *Membranes, *Heavy metals, Acids, Alkalis (Bases), Ions, Separation techniques, Thin films, Laboratory

tests, Performance, Pressure, Temperature, Hydrogen ion concentration, Oxidation, Hydrolysis, Optimization, *Waste water treatment, Water reuse, Industrial wastes.
Identifiers: *Annealing, Flux, Rejection, Thickness, *Metal finishing wastes.

Seventeen different reverse osmosis membranes were evaluated as to their ability to separate heavy metal ions, acids, bases, and cyanides from metal finishing wastewaters. Although no one membrane was found to be effective for all effluents, membranes of 5 different polymers showed considerable promise. Simulated acidic nickel, iron, zinc, and copper plating bath rinses were effectively treated by ultrathin membranes of cellulose acetate, cellulose methyl sulfonate O-propyl sulfonic acid, or B-glucan acetate diaminoethyl ether, with water fluxes of 30 gal/ft2-day and metal ion rejections of 99.9%. Simulated chromic acid rinses, subjected to treatment by ultrathin cellulose methylsulfonate O-propyl sulfonic acid membranes, exhibited a 27 gfd flux, with 95% chromium ion rejection at pH 2.5. These investigations have demonstrated that ultrathin membrane separation performance can be modified by: (1) modifying the chemical composition; (2) optimizing the annealing conditions; (3) producing as thin a membrane as practical; and (4) using a polysulfone support film. Preliminary engineering considerations for reverse osmosis applications to treatment and recycle of acidic copper plating bath rinse waters show a 99.8% copper recovery and a 99.9% recovery of the water. (Lowry-Texas)
W72-06844

AERATED LAGOON TREATMENT OF SULFITE PULPING EFFLUENTS.
Crown Zellerbach Corp., Lebanon, Oreg. Lebanon Div.

Copy available from GPO Sup Doc, $1.25; microfiche from NTIS as PB-208 212, $0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1970. 135 p, 21 fig, 21 tab, 17 ref. EPA Program 12040 ELW--12/70.

Descriptors: *Sulfite liquors, *Pulp wastes, *Oxidation lagoons, On-site investigations, Biological degradation, Organic loading, Aeration, Hydrogen ion concentration, Temperature, Cost analysis, Operation and maintenance, Industrial wastes, *Waste water treatment, *Aerated lagoons.

Weak washwater from a pulp mill, evaporator condensate from the spent liquor recovery system, and paper machine white water effluents were treated over a 17 month period in a secondary treatment plant consisting of 2 aeration basins. One basin was equipped with two 75 hp aerators and the other with six 25 hp aerators. Piping was designed to permit series and parallel operation of the two basins, and provisions were made to recycle treated waste. Series operation was superior to parallel operation for the wastes treated. The two 75 hp aerators were much more efficient in both mixing and aeration capacity than the smaller 25 hp units. Installed costs were $285/hp for the 75 hp aerators and $375/hp for the 25 hp aerators. An 80% BOD reduction in the system was achieved at a loading of 2.2 lbs BOD/hp-hr equivalent to a daily load of 16,000 lbs BOD. Mill waste subjected to 80 to 85% BOD removals did not readily support slime growth in simulated streams and slime produced from untreated wastes was 2 to 3 times as much as was produced by treated wastes of equivalent BOD. Total operating costs including interest on investment and depreciation was $4.79/ton of production, while total operating cost per pound of BOD destroyed was 3.48 cents. (Lowry-Texas)
W72-06845

MULTI-SYSTEM BIOLOGICAL TREATMENT OF BLEACHED KRAFT EFFLUENTS.
Mead Corp., Chillicothe, Ohio.

Copy available from GPO Sup Doc, $2.00; microfiche from NTIS as PB-208 213, $0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1971. 270 p, 24 fig, 42 tab, 24 ref. EPA Program 12040 EMY--12/71. WPRD-55.

Descriptors: *Pulp wastes, *Sulfite liquors, *Pilot plants, Sampling, Monitoring, Trickling filters, Oxidation lagoons, Oxygenation, Mathematical models, Data processing, Industrial wastes, Sludge, Biochemical oxygen demand, *Waste water treatment.
Identifiers: *Combination treatment.

Two high rate trickling filters packed with PVC media, an oxidation ditch with brush type aeration, and an earthen lagoon with mechanical surface aeration, were piped to allow them to be run in various combinations as multi-stage pilot scale treatment units for treatment of integrated kraft pulp and paper primary effluent. The combinations operated on normal strength wastewater included: (1) trickling filter in series (TF); (2) TF to aerated lagoon (AL); (3) oxidation ditch (OD) to AL; and (4) OD to TF. Elevation of the BOD5 from approximately 200 to 500 mg/l was accomplished by the addition of black liquor to the clarified effluent and the following combinations were tested: (1) TF to OD to TF; (2) TF to AL; and (3) TF in series followed by OD. Operation of the OD with clarification and sludge return produced as high as 94% BOD removals, the highest of any of the systems tested. The trickling filter with recycle performed slightly better than conventional trickling filters, reducing the BOD by 60 to 70%. 80% BOD5 removals were accomplished through short detention aerated lagoon treatment followed by clarification. Modeling of both the individual and combined treatment system was accomplished, but with only limited applicability due to lack of sufficient additional data. (Lowry-Texas)
W72-06846

COMBINED TREATMENT OF MUNICIPAL, KRAFT LINERBOARD AND FIBERBOARD MANUFACTURING WASTES.
Macon Board of Water Commissioners, Ga.

Copy available from GPO Sup Doc, $1.25; microfiche from NTIS as PB-208 215, $0.95. Environmental Protection Agency Water Pollution Control Research Series, February 1971. 131 p, 14 fig, 23 tab, 15 ref. EPA Program 11060 DPD--02/71.

Descriptors: *Pilot plants, *Wood wastes, *Municipal wastes, Sedimentation, *Pulp wastes, Aeration, Trickling filters, Pump and paper industry, Nutrients, Disinfection, Chlorination, Coliforms, Cost analysis, Technical feasibility, Economic feasibility, Sludge, *Waste water treatment.
Identifiers: *Combined treatment.

An experimental 120 gpm pilot treatment plant was used to treat a combined waste composed of municipal sewage, wastewater from a Kraft linerboard mill and wastewater from a groundwood-cold extraction caustic insulation board mill. The pilot plant included combined and/or separate primary sedimentation units, followed by one secondary system consisting of 24 to 30 hrs of extended aeration, and one high rate plastic media trickling filter followed by 12-15 hrs of aeration. The two secondary treatment systems operated in parallel, receiving one-half of the total flow in each, and both systems had secondary sedimentation and sludge return. The pilot plant achieved in excess of 90% BOD removal, with no supplemental nutrient additions needed. Primary sedimentation was needed only for the groundwood-cold extraction effluents. Chlorine dosage required for a 95% kill averaged 35 mg/l, but the presence of the Klebsiella organism in the groundwood-cold extraction effluent interfered with the fecal coliform test making the results inconclusive. Total estimated operating and capital costs for the combined treatment are less than for separate plants, and comparable BOD removal is being achieved only in the present municipal waste treatment facilities. (Lowry-Texas)
W72-06848

STUDIES OF LIMESTONE TREATMENT OF ACID MINE DRAINAGE. PART II.
Bituminous Coal Research, Inc., Monroeville, Pa.

Copy available from GPO Sup Doc, $1.25; microfiche from NTIS as PB-208 326, $0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1971. 135 p, 39 fig, 51 tab, 19 ref. EPA Program 14010 EIZ--12/71.

Descriptors: *Acid mine water, *Coal mine wastes, *Neutralization, *Chemical precipitation, Limestones, Lime, Iron, Oxidation, Hydrogen ion concentration, Particle size, Sludge, Aeration, Sedimentation, Coagulation, Safety, Cost analysis, *Waste water treatment.
Identifiers: *Detention time.

Laboratory investigations have demonstrated the feasibility of using limestone in place of pure lime for treating acid mine drainage for the neutralization of acidity and removal of iron to acceptable limits. The process consists of: (1) equalization; (2) addition of pulverized limestone and mixing; (3) aeration; (4) slurry recirculation to the mixing area; (5) sludge settling; and (6) sludge dewatering and disposal. Total costs for treating coal mine discharges within the limits of quality normally encountered, ranged from 13.6 to 97.3 cents per 1000 gallons of waste treated, including sludge disposal. Advantages of limestone over lime include: (1) lower costs per unit weight of chemical necessary to neutralize similar quality and quantity drainage waters; (2) fewer safety problems; (3) fewer harmful effects on receiving waters; and (4) volume of sludge from limestone treatment can be as much as 80% less than from lime treatment and contain as much as 15 times the solids content of lime sludges. Disadvantages include: (1) slow oxidation rate of ferrous iron at low pH obtained from limestone treatment; (2) long detention times; (3) production of fine particles in effluent requiring chemical coagulation; and (4) the questionable availability of finely divided limestone of the desired quality. (See also W71-00620) (Lowry-Texas)
W72-06849

PHOSPHORUS REMOVAL WITH PICKLE LIQUOR IN AN ACTIVATED SLUDGE PLANT.
Milwaukee Sewerage Commission, Wis.

Copy available from GPO Sup Doc, $1.25; microfiche from NTIS as PB-208 216, $0.95. Environmental Protection Agency Water Pollution Control Research Series, March 1971. 143 p, 25 fig, 7 tab, 19 ref. EPA Program 11010 FLQ--03/71.

Descriptors: *Phosphorus, *Activated sludge, *Chemical precipitation, Iron, Separation techniques, Hydrogen ion concentration, Alkalinity, Acids, *Waste water treatment.
Identifiers: Suspended solids.

Hot waste pickle liquor (ferrous sulfate) as an iron source was successful in precipitating phosphorus from solution in a 115 mgd East Plant of Milwaukee's Jones Island Activated Sludge Wastewater Treatment Plant. An 85 mgd section of the plant receiving the same influent was operated as a control. East Plant effluent from January 12 to December 31, 1970 averaged 0.70 mg/l P, and the concentration was below the 0.5 mg/l P objective 55.1% of the time. Based on the 1970 average screened total soluble phosphorus concentration of 8.2 mg/l P, the East Plant with iron addition, achieved 91.3% removals (0.70 mg/l P effluent residual), while the control West Plant removed 83.1% (1.4 mg/l P residual). For an average total concentration of 3.1 mg/l, the East Plant achieved

90.7% removal while the West Plant removed 67.5%. An average of 9.4 mg/l iron was added to the East Plant, but no optimum dosage was determined. Comparison of efficiencies of purification, pH, alkalinity, and microscopic examinations of the sludge microorganism indicated that the addition of unneutralized waste pickle liquor did not adversely affect purification processes. (Lowry-Texas)
W72-06850

TREATMENT OF SELECTED INTERNAL KRAFT MILL WASTES IN A COOLING TOWER.
Georgia Kraft Co., Rome. Research and Development Center.

Copy available from GPO Sup Doc, $1.25; microfiche from NTIS as PB-208 217, $0.95. Environmental Protection Agency Water Pollution Control Research Series, August 1971. 149 p, 16 fig, 9 tab, 16 ref. EPA Program 12040 EEK--08/71.

Descriptors: Pulp and paper industry, *Cooling towers, *Waste water treatment, Research and development, On-site investigations, Water reuse, Aeration, Biochemical oxygen demand, Foaming, Cost analysis, Construction costs, Operation and maintenance, *Pulp wastes.
Identifiers: *Treatability studies.

Cooling of pulp mill condensates, decker filtrate, turpentine decanter underflow and condenser waters from a barometric type evaporator produced the removal of 10,000 lbs BOD per day and an 8 to 10 mgd reduction in overall mill water needs for an 850 ton/day Kraft linerboard mill. The 25% to 30% BOD reduction is attributed to physical stripping of volatile components. A 5 to 10% improvement also can be obtained by adding supplemental nutrients to the tower feed, but the final removals will depend mainly upon the BOD of the volatile components of the stream. Emissions of 1 to 2 ppm sulfur compounds from the tower have occurred as expected, but such small concentrations are unlikely to present any air pollution hazards. No significant operational problems have occurred, and preliminary treatability studies have indicated that the cooling tower blowdown does not adversely affect biological treatment processes. Cooling tower installation costs are similar to barometric to surface condenser conversion costs, but reduced wastewater treatment costs dictate an estimated savings of $250,000 in construction costs and $20,000/year in operating costs. (Lowry-Texas)
W72-06851

POTATO WASTE TREATMENT.
Federal Water Pollution Control Administration, Corvallis, Oreg. Pacific Northwest Water Lab.

Available from the National Technical Information Service as PB-208 218, $3.00 in paper copy, $0.95 in microfiche. Proceedings of a Symposium jointly sponsored by Federal Water Pollution Control Administration and Idaho University, Moscow, March 8, 1968, published July 1968. 88 p, 11 fig, 7 tab, 15 ref. EPA Program 12060--03/68.

Descriptors: *Potatoes, *Industrial wastes, *Waste water treatment, *Waste treatment, Water quality control, Oxidation lagoons, Tertiary treatment, Sprinkler irrigation, Anaerobic conditions, Aerobic conditions.

Several of the Nation's largest fishkills have resulted in part from the increase of largely untreated potato wasteloads. The status of waste treatment technology in the potato processing industry was reviewed at a symposium jointly sponsored by the Federal Water Pollution Control Administration and the University of Idaho. In addition, potato waste treatment research needs were discussed. (See W72-06853 thru W72-06859)
W72-06852

PERSPECTIVES AND PROBLEMS IN TREATMENT OF POTATO PROCESSING WASTES,
Federal Water Pollution Control Administration, Corvallis, Oreg. Pacific Northwest Water Lab.
James R. Boydston.
In: Potato Waste Treatment, Proceedings of a symposium sponsored by FWPCA and Idaho University, March 1968. p 1-3.

Descriptors: *Potatoes, *Industrial wastes, Financing, Legislation, Federal government, Idaho, *Waste water treatment, Water quality control.
Identifiers: *Population equivalent.

Total annual average potato production in the United States is 15 million tons, of which 25% is grown in the State of Idaho. The wastes produced in processing one ton of potatoes is equivalent in organic strength to a population of 300 to 500 people, so the average daily national potato production can create an untreated waste load equivalent to 6 to 8 million people. This means a population equivalent of nearly 2 million people in Idaho alone. Increasing municipal and industrial water usage in these and other areas, coupled with a constant supply, means that more utility must be obtained from each volume of water, necessitating higher and higher levels of treatment. To aid in keeping costs to a minimum while still providing adequate treatment, the FWPCA has established funds for research, both at the facilities of the FWPCA laboratories, and at colleges, universities, and private institutions. By working together with the various facets of industry and the academic world, the FWPCA hopes to pool research efforts with funds to obtain a cleaner environment. (See also W72-06852) (Lowry-Texas)
W72-06853

MECHANISMS OF ANAEROBIC WASTE TREATMENT,
California Univ., Berkeley.
Gordon L. Dugan, and William J. Oswald.
In: Potato Waste Treatment, Proceedings of a symposium sponsored by FWPCA and Idaho University, March 1968. p 5-17, 5 fig, 1 tab.

Descriptors: *Oxidation lagoons, *Anaerobic digestion, *Municipal wastes, Methane bacteria, Acid bacteria, Sulfur bacteria, Algae, Mixing, Hydrogen ion concentration, Temperature, Toxicity, Dissolved oxygen, Light intensity, Sludge, Depth, Organic loading, Design criteria, Odors, Efficiencies, *Waste water treatment.
Identifiers: *Detention time.

Anaerobic treatment of various municipal and industrial wastes is practiced mainly in anaerobic digesters, facultative lagoons, and anaerobic lagoons. Decomposition takes place in two phases, during anaerobic digestion. The first, or 'acid' phase involves the breakdown of settled sludge to organic volatile acids and energy, and the second or 'gas' phase consists of the conversion of the organic volatile acids to CO2, CH4, H2, N2, and minor amounts of other gases. Digestion temperatures usually lie somewhere between 15 and 35 deg C, with gas collection and re-use as a heat source being practiced in conventional anaerobic digestion. Digester loading is expressed as lbs volatile solids/ft3/day and range from 0.08 to 0.1. Facultative ponds are initially loaded at from 20 to 50 lbs BOD5/acre/day, but once established they may be loaded as high as 1000 lbs BOD5/acre/day. Detention times of 3, 30, 90 and 8-10 days are common for aerobic ponds, conventional digestion, facultative ponds, and anaerobic ponds respectively, with efficiencies for same being 80% for aerobic ponds, 85 to 95% for facultative ponds, and 70% for anaerobic ponds. Lack of control of odor problems has hindered application of anaerobic ponds, and research work to develop such controls is needed. (See also W72-06852) (Lowry-Texas)
W72-06854

RECENT DEVELOPMENTS IN ANAEROBIC WASTE TREATMENT,
Washington Univ., Seattle.
D. A. Carlson.
In: Potato Waste Treatment, Proceedings of a symposium sponsored by FWPCA and Idaho University, March 1968. p 19-26, 1 fig, 8 ref.

Descriptors: *Anaerobic digestion, *Industrial wastes, *Waste water treatment, Organic loading, Temperature, Energy conversion, Methane, Odors, Hydrogen sulfide, Filtration, Solubility, Sulfite liquors.
Identifiers: *Anaerobic contact process, *Anaerobic filters, *Solids recycle, Soil filters, Detention time, Potato wastes.

The anaerobic contact process and the anaerobic filter may both have potential application to the potato waste treatment problem. The anaerobic contact process is somewhat similar to the activated sludge method, with recycled solids being used to give a mixed liquor solids concentration of from 7000 to 12,000 mg/l. At operating temperatures of about 90 deg F, and solids levels in the 7,000 - 12,000 mg/l range, 12-13 hours detention time is sufficient to give 90% BOD removal and 90% suspended solids removal. The anaerobic filter, however, is designed to operate at ambient temperatures. Flow is upward through rock, usually limestone, and sludge particles not only fasten to the rocks but are suspended in the interstitial spaces by the upward flow. Solids retention time can be on the order of hundreds of days. At temperatures of 25 deg C the filter was operated on synthetic protein-carbohydrate wastes with influent COD of 1500 mg/l. At detention times of 4.5, 9, and 18 hours, COD removals of 63, 84, and 97% respectively were obtained. The basic advantages of both processes included: (1) the process is not restricted by the cost or rate of input of oxygen to the system; (2) much of the incoming energy is recovered in the form of methane; and (3) solids production in anaerobic processes is an order of magnitude less than in conventional aerobic processes. (See also W72-06852) (Lowry-Texas)
W72-06855

PILOT PLANT STUDIES ON SECONDARY TREATMENT OF POTATO PROCESSING WASTES,
Federal Water Pollution Control Administration, Corvallis, Oreg. Pacific Northwest Water Lab.
Kenneth A. Dostal.
In: Potato Waste Treatment, Proceedings of a symposium sponsored by FWPCA and Idaho University, March 1968. p 27-41, 3 fig, 5 tab, 3 ref.

Descriptors: *Oxidation lagoons, *Aerobic conditions, *Anaerobic conditions, Industrial wastes, Pilot plants, Potatoes, Design criteria, Mixing, Temperature, Aeration, Methane, Odor, Cost analysis, *Waste water treatment.
Identifiers: *Suspended solids.

Two pilot scale lagoon systems were designed and constructed, the first being an anaerobic lagoon followed by a surface aerated lagoon, and the second consisting solely of a surface aerated lagoon. Tests were performed on both systems to determine the feasibility of treating potato wastes by such methods. Preliminary results have indicated that: (1) BOD5 removals in excess of 90% can be achieved with primary clarification plus anaerobic-aerobic lagoons in series; (2) contents of the anaerobic lagoon must be mixed for proper system operation; (3) covering the anaerobic lagoon helps to control odors and conserve heat; and (4) secondary clarification must follow the aerobic lagoon for solids removal. Preliminary cost estimates were formulated for both systems providing 84% removal of the 1700 mg/l influent BOD (270 mg/l BOD in effluent). Estimates for aerobic pond treatment alone were $48,000/year/mgd treated, while estimates for the anaerobic-aerobic pond series were $39,000/year/mgd treated, both based on a 24

hr/day, 300 day/year operation. (See also W72-06852) (LowrysTexas)
W72-06856

OTHER TREATMENT METHODS FOR POTATO WASTES,
Cornell, Howland, Hayes, and Merryfield, Corvallis, Oreg.
John W. Filbert.
In: Potato Waste Treatment, Proceedings of a symposium sponsored by FWPCA and Idaho University, March 1968. p 43-53, 2 fig, 1 tab, 4 ref.

Descriptors: *Potatoes, *Industrial wastes, Activated sludge, Trickling filters, Sedimentation, Separation techniques, On-site investigations, Pilot plants, Organic loading, Aeration, Cost analysis, *Waste water treatment.
Identifiers: *Tube settlers, *Suspended solids.

A full scale activated sludge plant is being designed to treat potato processing wastes to provide design criteria and information which will hopefully help overcome problems associated with the use of the activated sludge method for potato waste treatment. The system includes aeration, clarification, and aerobic digestion of the wastes, and it is scheduled for start-up in September 1968. Another new concept in waste treatment for the potato processing industry is the biological filter, of the plastic media type subjected to super-rate loadings. Advantages and disadvantages of super-rate filtration versus conventional activated sludge include: (1) advantages of (a) lower temperature loss, (b) lower power requirements, (c) lower total operating costs, (d) reduced waste biological solids production; and (2) disadvantages of (a) lower organic removal efficiency, (b) less absorption of shock loads, (c) greater probability of nutrient deficiency and pH variation problems, (d) greater odor production risk. To complement both the preceding systems, tube settling devices have been developed which are capable of flows over 400% of those generally used in conventional clarification, operating at rates of 2.0 to 2.5 gpm/ft2. Tube settlers are now being marketed commercially for water and wastewater treatment and should be carefully considered in new treatment plant designs. (See also W72-06852) (Lowry-Texas)
W72-06857

SPRAY IRRIGATION TREATMENT,
American Potato Co., Moses Lake, Wash.
Frank C. Haas.
In: Potato Waste Treatment, Proceedings of a symposium sponsored by FWPCA and Idaho University, March 1968. p 55-59.

Descriptors: *Sprinkler irrigation, *Industrial wastes, *Potatoes, Aerobic conditions, Anaerobic conditions, Temperature, Sedimentation, Screens, Nozzles, Precipitation (Atmospheric), Percolation, Operation and maintenance, Odors, Alfalfa, Cost analysis, *Waste water treatment.

A spray irrigation potato waste treatment system was designed as an integral part of the American Potato Company's Washington Plant. Effluent from the processing plant comes from three main sources: (1) sanitary wastes which discharge into a septic tank and then into an underground drainfield; (2) potato fluming and washing waters with 600 to 1200 ppm COD; and (3) 2000 to 3000 ppm COD process waters. Both the washing and process waters are screened and settled, and pumped to the spray field. Total waste flow to the spray field (120 acres in area) is about 1.2 mgd, equivalent to an evenly distributed 0.35 in. of precipitation/day, or 100 in. per year. Spraying is done by sections, with an average of 3.5 in. being deposited on each section one day out of every 10 days. It is estimated that 5 to 6 million lbs of organic solids are deposited on the area per season. Initial capital investment for equipment was $30,000 without the land, and operating costs average $40,000 per year. Ground cover is a mixture of grasses and alfalfa, and ponding has occurred only on bare areas. Odor problems are also minimal, being noticeable only when ponding occurs. (See also W72-06852) (Lowry-Texas)
W72-06858

POTATO WASTE TREATMENT RESEARCH NEEDS,
Idaho Univ., Moscow.
H. S. Smith.
In: Potato Waste Treatment, Proceedings of a symposium sponsored by FWPCA and Idaho University, March 1968, p 61-72.

Descriptors: *Potatoes, *Industrial wastes, Anaerobic conditions, Aerobic conditions, Mathematical models, Waste assimilative capacity, Tertiary treatment, *Waste water treatment, Water quality control.

An outline of basic requirements for determing the type and degree of waste treatment required to treat the various potato processing wastewaters, as well as a characterization of each flow, is presented. Sources include washing, peeling, trimming, slicing, blanching, and final processing wastewaters. Overall average and characteristics include: (1) 2.0 gal of water/pound of potatoes processed; (2) 6000 mg/l COD; (3) 50% COD removable by plain sedimentation; and (4) 17,000 mg/l dissolved solids. Treatment processes include physical, chemical, and biological systems, as well as various combinations of the three. General guidelines for determining applications of various presently available treatment methods, as well as for methods currently under development, are presented. Further research on better prediction models and their applications is indicated. (See also W72-06852) (Lowry-Texas)
W72-06859

UTILIZATION AND DISPOSAL OF CRAB AND SHRIMP WASTES,
Alaska Univ., College. Cooperative Extension Service.
Vivian Mendenhall.
Available from the National Technical Information Service as COM-71-01092, $3.00 in paper copy, $0.95 in microfiche. University of Alaska Sea Grant Marine Advisory Bulletin No. 2, March, 1971. 40 p, 2 tab, 126 ref.

Descriptors: *Canneries, *Commercial shellfish, *Industrial wastes, Fish handling facilities, Crab, Shrimp, Waste water treatment, Sedimentation, Incineration, Separation techniques, Byproducts, Proteins, Transportation, Marketing, Cost analysis, Water quality control, Alaska, Waste treatment, Waste disposal.
Identifiers: *Waste reduction, *Chitin.

Common waste disposal practices of the Alaskan shellfish processing industries have been to discharge their processing wastes to the body of water on which they were located. The practices, which have resulted in high bacterial counts and low dissolved oxygen levels, have been prohibited, prompting the search for usable byproducts and/or feasible waste treatment methods. However, crude waste meal and whole shell products offer little hope for further marketing, while chitinous compounds are presently of academic interest only. Protein concentrates and shred meat both have a certain established market at present. Even if a suitable by-product were developed from one of these areas, waste products requiring treatment would still remain, requiring some form of waste treatment. An optimum solution will involve the use of by-product recovery and process control to minimize the amount of wastes to be treated, thereby reducing the cost and complexity of the facilities. Recommendations include expanded research in by-products, waste characteristics, receiving waters and other factors as well as the employment of professional consultants for final evaluations. (Lowry-Texas)
W72-06861

PROGRAM OPERATIONAL SUMMARY--OPERATIONAL 90-DAY MANNED TEST OF A REGENERATIVE LIFE SUPPORT SYSTEM,
McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
J. K. Jackson, J. R. Wamsley, M. S. Bonura, and J. S. Seeman.
Available from the National Technical Information Service. $3.00 in paper copy, $0.95 in microfiche. National Aeronautics and Space Administration Contractor Report No. CR-1835, January 1972. 92 p, 23 fig, 21 fig, 3 ref.

Descriptors: *Environmental engineering, *Water reuse, *Laboratory tests, *Monitoring, Atmosphere, Carbon dioxide, Urine, Humidity, *Waste water treatment, Psychological aspects.
Identifiers: *Regenerative life support system, Space station simulator, Closed ecological systems, Human factors engineering.

An operational 90-day manned test of a regenerative life support system was successfully completed September 11, 1970. A four man crew in a space station simulator was maintained in a two gas atmosphere at 10 psia (3.05 psia oxygen, 6.9 psia nitrogen partial pressure). All crew equipment and expendables were stored on board at the start of the mission to eliminate pass-in operations. In order to minimize the amount of stored supplies: (1) carbon dioxide removed from the atmosphere was processed by a Sabatier reactor, and the resultant 332 pounds of water was electrolyzed and the oxygen returned to the atmosphere for crew consumption; (2) the wash water recovery unit processed and dispensed 10,447 lb of water, enough for unrestricted crew use; (3) a potable water recovery system reclaimed 2357 lb of water from urine and humidity condensate which was certified fit for crew consumption, supplying all requirements for consumption and testing after start-up; and (4) uncompressed, freeze-dehydrated food was shown to be acceptable as a main diet. A further summary of bacteriological factors, crew training and morale, and other pertinent factors is presented. The objective of providing useful data for evaluations of such systems and testing present equipment and methods was successfully attained. (Lowry-Texas)
W72-06863

THE RECOVERY OF SODIUM CHLORIDE FROM BLEACHED KRAFT PULP MILLS,
Toronto Univ. (Ontario). Dept. of Chemical Engineering and Applied Chemistry.
D. W. Reeve, and W. H. Rapson.
Pulp and Paper Magazine of Canada, Vol 71, No. 13, July 3, 1970, Technical Paper No. T274, p 48-54, 4 fig, 5 tab, 28 ref.

Descriptors: *Sulfite liquors, *Pulp wastes, *Separation techniques, Sodium chloride, Filtration, Leaching, Chemical precipitation, Evaporation, Distillation, Crystallization, Solubility, Lime, Fibers (Plant), Cost analysis, Pulp and paper industry, *Waste water treatment, Water reuse.
Identifiers: *Chemical regeneration, *Chlorine dioxide.

The modified chemical recovery process for elimination of kraft pulp mill effluents includes: (a) use concentrated sulphide-lean white liquor to dissolve sodium sulphide from the smelt, leaving sodium chloride and sodium carbonate undissolved; (b) dissolve the solid residue to make sulphide-lean green liquor for causticizing; (c) evaporate the chloride bearing sulphide-lean white liquor to precipitate sodium chloride plus some sodium carbonate; (d) leach the sodium carbonates and some sodium chloride from the precipitate from (c) leaving pure sodium chloride; (e) use the solution from (d) with bleach plant effluent to dissolve the chloride-carbonate residue from the smelt in (b). System advantages include: (1) elimination of effluents; (2) capital and operating costs for water reuse and chemical regeneration are much less than those for waste treatment; (3) any amount of sodium chloride can be removed

from the cycle and recrystallized; (4) chemical purchases are eliminated except for sulfuric acid; (5) high chloride concentrations are confined to the recovery system, not the pulping system; (6) green liquor volume may be greatly reduced; (7) a sodium hydroxide solution is produced suitable for caustic extraction and sodium hypochlorite solution preparation; and (8) pulp quality is improved by using chlorine dioxide in oxidation stage. (Lowry-Texas)
W72-06864

FACTORS AFFECTING THE AVAILABILITY OF HEAVY METALS TO INHIBIT ANAEROBIC DIGESTION,
D Stevenage (England). Water Pollution Research Lab.
F. E. Mosey, J. D. Swanwick, and Deborah A. Hughes.
Water Pollution Control, Vol 70, No. 6, p 668-678, 1971, 6 fig, 5 tab, 10 ref.

Descriptors: *Anaerobic digestion, *Heavy metals, *Inhibition, Toxicity, Sulphides, Solubility, Ammonia, Hydrogen ion concentration, Chemical precipitation, Nitrogen, Mixing, Hydrogen sulphide, Laboratory tests, *Waste water treatment.

The following factors have been demonstrated on a laboratory scale to reduce the availability of heavy metals to inhibit anaerobic digestion: (1) high concentrations of soluble sulphides (effective under all conditions); (2) high concentrations of ferrous sulphide (less effective against shock doses); (3) high carbonate ion concentrations with corresponding high pH values (most marked for cadmium, nickel, and copper); and (4) high chloride ion concentrations (marginally effective for silver and possibly lead). Operating conditions in the digester were also critical since increased retention time: (1) increases proportion of sulfur compounds converted to hydrogen sulphide; (2) increases proportion of protein nitrogen converted to ammonia and hence raises pH values; and (3) decreases redox potential. In addition, increased solids content also increases ammonia concentrations, thereby raising pH values. Therefore, procedures employed for the prevention and treatment of inhibition of digestion by heavy metals must be used with the systems approach in mind, with the overall operation of the system accounted for. (Lowry-Texas)
W72-06866

SOLVENT EXTRACTION OF NICKEL AND ZINC FROM A WASTE PHOSPHATE SOLUTION,
Bureau of Mines, Rolla, Mo. Rolla Metallurgy Research Center.
H. E. Powell, L. L. Smith, and A. A. Cochran.
Report of Investigations 7336, January 1970, 14 p, 9 fig, 4 tab.

Descriptors: *Coating, *Corrosion control, *Phosphates, Industrial wastes, Separation techniques, Solvent extractions, Metals, Byproducts, Nitrate, Sludge, Laboratory tests, Water quality control, *Waste water treatment.
Identifiers: *Zinc, *Nickel.

The phosphate coating reaction is commonly used to make metal surfaces relatively smooth, nonconductive and corrosion resistant. In the process, molecules on the surface of the metal being coated are replaced and released into solution. Several million gallons of wastes from this process, containing large amounts of nickel, zinc, and phosphates, as well as lesser amounts of copper, manganese and lead are discharged to waterways annually. Continuous, countercurrent solvent extractions were performed on waste phosphate solutions used in phosphating automobile bodies for evaluation of solvent extraction as a technique for the selective recovery of nickel and zinc from phosphating solutions. Separate zinc, nickel, and phosphate products, essentially free of each other, were produced. Zinc was 99% extracted by di-2-ethyl-hexyl phosphoric acid in kerosine, and nickel was 99% extracted by dinonyl naphthalene sulfonic acid in butylether, with the zinc extraction being more efficient, and both extractions being more efficient if zinc is extracted first. Essentially all the phosphate remained in the aqueous raffinate. Results are also shown for the other constitutents. (Lowry-Texas)
W72-06868

EXPLOITATION OF MINERALS IN DISPOSAL BRINES,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
A. G. Collins, and M. E. Crocker.
Preprint of Paper No SPE 3453 presented at Annual Fall Meeting of Society of Petroleum Engineers of AIME, October 3-6, 1971, New Orleans, La. 8 p, 6 tab, 6 ref.

Descriptors: *Industrial wastes, *Brine disposal, *Water reuse, *Mineralogy, *Chemical properties, Injection wells, Oil industry, Methodology, Brines, Chemical analysis.
Identifiers: *Minerals recovered from brines.

The practice of pooling disposal brines is gaining momentum in the petroleum industry, and large quantities of brines are processed by single disposal facilities. Through a survey of these facilities, the economic value of the minerals in some of these brines was determined. Six of the 40 sampled brines contain concentrations of minerals and values comparable with those of a commercial brine; 29 brines contain concentrations of minerals more valuable than those found in seawater. One sample was near potable and one was suitable for irrigation. (Woodard-USGS)
W72-06915

WATER AND WASTE WATER,
Drexel Univ., Philadelphia, Pa.
W. L. Zemaitis.
In: Environmental Health, Academic Press, New York. 1971. p 149-187. 4 fig, 6 tab, 26 ref.

Descriptors: *Waste water (Pollution), *Domestic water, *Domestic wastes, *Industrial wastes, *Industrial water, Groundwater, Surface waters, Treatment, Water quality, Water supply.
Identifiers: *Environmental health, Source considerations.

Water for domestic use is discussed in terms of its history, source considerations, ground water supply, surface water supply, and treatment. Water for industrial use is discussed in terms of quality, quantity, and treatment. The specifics of waste water, such as quantity, characteristics, collection systems, treatment, and stream quality criteria are examined. Present and future considerations for industrial waste treatment processes are evaluated and the waste treatment processes of regional treatment (combined industrial and domestic waste), mixing, tertiary, and advanced treatments are discussed. (Strachan-Chicago)
W72-06939

OPPORTUNITIES AND PLANS FOR SEWAGE RENOVATION ON FOREST AND WILDLANDS IN MICHIGAN,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
D. H. Urie.
Michigan Academician, Papers of the Michigan Academy of Science, Arts, and Letters, Vol. 4, No. 1, p 115-124, Summer 1971. 2 fig, 1 tab, 13 ref.

Descriptors: *Sewage disposal, *Planning, *Michigan, Sewage effluents, Sewage treatment, Sewage sludge, Costs, Ecology, Quality control, *Ultimate disposal.
Identifiers: *Sewage renovation, Environmental protection.

Research and research needs for Michigan in the field of sewage renovating are discussed. Each sewage renovation project, it is to be successful, must provide for final disposal of the nutrients, organic wastes, and other materials contained in the effluent. Besides the benefits of fertilization, irrigation water, and groundwater recharge, the renovation system must insure environmental protection at a lower net cost than alternative 'final' solutions. Considerable research is needed in all aspects of the sewage renovation process. Sewage sludge and tertiary processing of municipal wastes present additional problems of final disposal. There is also little research knowledge relating to the environmental effects and response of soils and crops to the disposal of wastes in the soil. Present studies of sewage disposal renovation projects in Michigan are discussed, i.e., Pleasant Lake, Cadillac; Fife Lake State Forest, Traverse City; and Middleville. Earlier studies by Pennsylvania State College and John R. Sheaffer for Muskegon County, Michigan are discussed. The need for research is unquestionable, considering the possible ecological repercussions resulting from sewage renovation and the scanty knowledge of the effects. Operational projects cannot wait for research results, and the mistakes made will provide the knowledge needed. The fact that two thousand years of spray irrigation systems are now operational without obvious environmental damage, implies that application of effluent to land probably does not cause serious harm to the environment. (Strachan-Chicago)
W72-06949

UNSOLVED ENGINEERING PROBLEMS IN WATER QUALITY MANAGEMENT,
Texas Univ., Austin.
E. F. Gloyna.
In: Man and his Environment, Vol. 1, Pergamon Press, Oxford. 1970, p 29-41. 1 tab, 6 fig, 9 ref.

Descriptors: *Water quality control, *Management, *Engineering, *Water pollution, *Waste water treatment, Technology, Economics, Costs, Water users, Planning, Pollution abatement.
Identifiers: *Water quality management, Optimum use, Indiscriminant release, Maximum beneficial use.

The major technical and economic problems of water pollution and wastewater management alternatives are examined. General water pollution characteristics are discussed and some specific examples of data presented. Water pollution is defined as a discharge into water that imposes an external cost on subsequent users, or as a discharge that interferes with the optimum use of water resources. There are emerging conflicts in water use. If people are given the right to indiscriminant releases of wastes they will profit for a while. If people are shown how to equitably use their water resources, they will profit for the rest of their lives. The 'maximum beneficial use' can only be realized when the problems related to resource development are thoroughly understood, the basic parameters controlling the solutions to some of the environmental problems are clearly defined, the economic tradeoffs are acceptable to the body politic, and the basic water needs of human beings are satisfied. Topics include: available alternatives, influence of water reuse on long range planning, monitoring devices, nutrient removal, toxic accumulations, taste and odor control, disposal of refractory organics, problems associated with translation of laboratory data to usable designs, and training. (See also W72-05931 and W72-05932) (Strachan-Chicago)
W72-06954

VELOCITY-GRADIENT PATHS IN COAGULATION,
Montgomery (James M.) Consulting Engineers, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 05F.
W72-06973

TREATMENT OF ACID MINE DRAINAGE, 'OPERATION YELLOWBOY,'
Dorr-Oliver Inc., Westpoint, Conn.
L. Girard.
Journal of the Pennsylvania Water Works Operators' Association, Vol. 38, p 67-77, 1966. 3 fig, 8 tab.

Descriptors: *Water pollution sources, *Waste water treatment, Water treatment, *Mine drainage, *Iron, Aluminum, Silica, *Ferrous sulfate, Hardness (Water), Hydrogen ion concentration, Dissolved oxygen, Mine wastes, *Acid mine water, Water pollution treatment.

'Yellowboy' is an insoluble iron hydrate produced as a result of acid mine drainage and the process of hydrolysis. It occurs as a yellowish-brown sediment on the bottom of stream beds and coats structures with a yellowish deposit when they come in contact with the mine water. 'Yellowboy' is formed when ferrous sulfate occurring in either an active or an abandoned coal mining operation is drained from its source and oxidized to ferric sulfate by the oxygen in the air and dissolved oxygen in the water. Mine water can be treated by the lime neutralization, aeration, sedimentation, and dewatering process to yield a product containing less than 6 ppm of iron at a neutral pH. Based on data derived from the pilot plant operation, the cost for 1,000 gals will range between $0.007 and $1.09. Manganese, aluminum and silica are also removed by lime neutralization, resulting in a decrease in total hardness. Even though active coal mine operators treat their mine drainage, the problem of mine water pollution will be present due to discharges from abandoned coal mines. (Bean-AWWARF)
W72-06977

EMERGENCY WATER SUPPLY FACILITIES FOR THE SCHUYLKILL COUNTY MUNICIPAL AUTHORITY,
Chester Engineers, Pittsburgh, Pa.
For primary bibliographic entry see Field 05F.
W72-06978

PACKAGE BIOLOGICAL SEWAGE TREATMENT,
Floyd L. Vermette.
U. S. Patent No. 3,494,463, 3 p, 6 fig, 9 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 2, p. 479, February 10, 1970.

Descriptors: *Patents, Biological treatment, *Liquid wastes, *Filtration, *Aeration, Domestic wastes, Industrial wastes, Farm wastes, Waste treatment, *Waste water treatment, Water pollution control, Pollution abatement, Mechanical equipment.

The apparatus includes aerobic treatment via a trickling filter, or packed aeration tower. Feed and recirculation is accomplished by an air lift pump. Aeration occurs by forced draft of air after its use for pumping. Anaerobic biochemical decomposition occurs in the lower compartment of a two-storied tank (Imhoff tank). In the modification designed for confined animal excrement treatment an object is to utilize treated effluent to convey fresh excrement back to the treatment device in a closed circuit. All final effluent other than digested sludge for fertilizer is eliminated. (Sinha-OEIS)
W72-07084

SLUDGE SETTLING APPARATUS,
Societe Generale d'Epuration et d'Assainissement, Paris (France). (Assignee).
Georges Andre Baud.
U. S. Patent No. 3,494,462, 4 p, 6 fig, 4 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 2, p 479, February 10, 1970.

Descriptors: *Patents, *Sludge treatment, *Aeration, Water purification, *Waste water treatment, Water treatment, Separation techniques, *Pollution abatement, Mechanical equipment, *Settling basins.
Identifiers: Settling apparatus.

The apparatus consists of a tank having an inlet for impure water or liquid, an overflow for clear water and at least one sludge-evacuation system. The settling tanks are separate from the aeration tanks. The rate of re-circulation is limited by the consideration of the power to be employed for pumping from one plant to the other and also by the large dimensions which the conduits may attain. Perfect evacuation of the sludges is effected by means of a partial syphon which acts as a flow regulator. (Sinha-OEIS)
W72-07085

PROCESS FOR FLOCCULATING AQUEOUS SUSPENSIONS,
American Cyanamid Co., New Castle, Pa. (Assignee).
Anthony Thomas Coscia.
U. S. Patent No. 3,493,502, 3 p, 2 fig, 2 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 1, p 222, February 3, 1970.

Descriptors: *Patents, *Flocculation, *Solid wastes, *Suspended solids, Municipal wastes, Industrial wastes, Sewage, Pollution abatement, Chemical treatment, *Waste water treatment, Water treatment, Water pollution control, Separation techniques.
Identifiers: Polymers, Gelation.

A polymeric flocculant is produced by reacting methylamine with epichlorohydrin and advancing the reaction, under alkaline conditions in the presence of water, to the point of incipient gelation of the reaction mixture. The final polymer solids content of the mixture is from about 10 per cent to about 30 per cent. The procedure is to be used for dewatering and/or settling aqueous suspensions of finely divided solids, such as sewage sludge and industrial process and waste water. (Sinha-OEIS)
W72-07088

METHOD FOR THE REMOVAL OF SUSPENDED MATTER IN WASTE WATER TREATMENT,
Allied Chemical Corp., Idaho Falls, Idaho. (Assignee).
John C. Eck.
U. S. Patent No. 3,493,501, 9 p, 4 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 1, p 222, February 3, 1970.

Descriptors: *Patents, *Flocculation, *Suspended solids, Suspension, Water purification, *Waste water treatment, Water pollution treatment, Pollution abatement, Sedimentation, Sewage treatment, Industrial wastes, Municipal wastes, Separation techniques.
Identifiers: Chemical treatment.

This method provides for the use of an anionic or cationic synthetic organic latex to flocculate and produce settling of finely divided organic and inorganic solids suspended in water. The floc may then be separated from the water by decantation, filtration, or by centrifugation and flotation. (Sinha-OEIS)
W72-07089

SLUDGE TREATMENT APPARATUS AND METHOD,
Simon-Hartley Ltd. (England). (Assignee).
Roger G. Knibb.
U. S. Patent No. 3,493,494, 3 p, 3 fig, 12 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 1, p 220, February 3, 1970.

Descriptors: *Patents, *Sludge treatment, Sewage sludge, *Sewage treatment, Digestion tanks, *Waste treatment, *Waste water treatment, Pollution abatement, Water pollution control, Mechanical equipment.

The treatment consists of passing a gas under pressure through a conduit into the lower end of piping for escape at or near the upper end. The piping is mounted outside of a sludge digester tank and provided at its lower end with an inlet for sludge from the digester tank and at its upper end with an outlet for the sludge into the digester tank. The sludge thus circulates through the piping from the bottom to the top of the digester tank. It passes a heating fluid through a jacket surrounding the piping. (Sinha-OEIS)
W72-07090

WATERCRAFT WASTE TREATMENT SYSTEM DEVELOPMENT AND DEMONSTRATION REPORT.
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.

Copy available from GPO Sup Doc, $1.25; microfiche from NTIS as PB-208 345, $0.95. Environmental Protection Agency Water Pollution Control Research Series, 134 p, 23 fig, 19 tab, 4 ref, September 1971. EPA Program 15020 DHG--09/71.

Descriptors: *Ships, *Water pollution sources, *Flocculation, Separation techniques, On-site investigations, Biochemical oxygen demand, Adsorption, Activated carbon, Organic loading, Coliforms, Sludge, Incineration, *Waste water treatment.
Identifiers: Electrocoagulation.

A shipboard sewage treatment system consisting of: (1) comminution of solids for ease of transport and further treatment; (2) Electro coagulation of sewage for ease of removal of suspended solids; (3) solids separation; (4) soluble BOD reduction with carbon adsorption; (5) coliform bacteria removal; and (6) solids incineration was designed to process shipboard sanitary, culinary, and laundry wastes during prolonged sea trials. Advantages of the electrochemical system include: (1) less vulnerability to hydraulic and chemical shock loads; (2) lesser physical size and weight than biological systems; (3) ease of automation; and (4) the treatment processes can be rapidly started and stopped. Waste stream characterization showed the BOD and suspended solids levels of shipboard wastes to be 2 to 3 times the concentrations common to municipal wastes. Shipboard wastes effluent from the demonstration plant contained essentially zero coliforms, 94 mg/l BOD, and 49 mg/l suspended solids, all below the 240 MPN/100mg, 100 mg/l, and 150 mg/l standards for coliforms, BOD and SS respectively. The development program was successful in demonstrating a practical and economically viable electro-chemical treatment system, and further refinements are continually being explored. (Lowry-Texas)
W72-07099

UNDERWATER STORAGE OF COMBINED SEWER OVERFLOWS.
Rohrer (Karl R.) Associates Inc., Akron, Ohio.

Copy available from GPO Sup Doc, $1.50; microfiche from NTIS as PB-208 346, $0.95. Environmental Protection Agency Water Pollution Control Research Series September 1971, 170 p, 43 fig, 14 tab, 33 ref. EPA Program 11022 ECV--09/71.

Descriptors: *Water pollution control, *Strom runoff, *Storage tanks, Pilot plants, Construction costs, Operation and maintenance, Flexibility, Optimization, Performance, Waste water treatment, Ohio.
Identifiers: *Combined sewer overflows, *Fabric.

Two 100,000 gallon collapsible tanks were anchored under water in Lake Erie to demonstrate, on a pilot scale, the feasibility of storing combined sewer storm overflow in underwater flexible tanks. Site selection, model testing, system design, construction, and one year's operation were included in the investigation. During the

year's operation, 988,000 gallons of storm overflow were contained and returned to the treatment plant for treatment. Preliminary construction costs of $1.88 per gallon of storage capacity showed promise of decreasing to $0.40 per gallon for optimum system sizes. Operation and maintenance costs must be kept minimal, with automatic operation, and only essential utilization of electrical power. It was determined that for larger installations, modular systems of 250,000 to 500,000 gallon basic unit tanks should be employed, with site characteristics determining both the overall feasibility of the system, and the optimum tank size should such a system be feasible. Life expectancy for tank materials can only be determined in full scale operation in the actual environment. The Sandusky Pilot Facility contained over 90% of the pollutional load which ordinarily would have been discharged and delivered it for treatment at the treatment plant. (Lowry-Texas)
W72-07100

DEWATERING OF MINE DRAINAGE SLUDGE.
West Virginia Univ., Morgantown. Coal Research Bureau.

Copy available from GPO Sup Doc, $1.00; microfiche from NTIS as PB-208 347, $0.95. Environmental Protection Agency Water Pollution Control Research Series December 1971, 90 p, 19 fig, 9 tab, 86 ref. EPA Program 14010 FJX--12/71.

Descriptors: *Acid mine water, *Chemical precipitation, *Neutralization, *Sludge, Hydrogen ion concentration, Alkalinity, Evaporation, Storage, Oxidation lagoons, Density, Sedimentation, Flotation, Coagulation, Dewatering, Vacuum drying, Filtration, Centrifugation, Ultrasonics, *Waste water treatment.

Sludge formed by the neutralization of acid mine drainage is generally affected by the acid mine water composition and the method of neutralization used. Most sludges generally contain hydrated ferrous or ferric oxides, gypsum, hydrated aluminum oxide, varying amounts of sulfates, calcium, carbonates, bicarbonates, and trace amounts of silica, phosphate, manganese, titanium, copper, and zinc. The more important physical properties of the sludges include settleability, density, 'dewaterability,' particle characteristics, particle surface properties, and sludge flow properties such as viscosity. The effects of both raw water chemistry and the various treatment processes on sludge composition are enumerated for each treatment process. The methods discussed include: (1) conventional lime neutralization; (2) mechanical aeration; (3) lagoon aeration; (4) pH; and (5) sludge recirculation. Several other processes, described and studied in slightly more detail, include the High Density Sludge Process, the Densator Process, the Elpo Treatment Process, and the use of magnetic sludge. Methods of thickening, conditioning and dewatering are also presented, with vacuum filtration appearing as the most feasible dewatering device at present. From the wide variety of processes and effects listed, it becomes obvious acid mine drainage problems must be dealt with individually on small scale experimental bases, since no two problems with have exactly the same response to treatment. (Lowry-Texas)
W72-07101

FOAM SEPARATION OF ACID MINE DRAINAGE.
Horizons Inc., Cleveland, Ohio.

Available from the National Technical Information Service as PB-208 411, $3.00 in paper copy, $0.95 in microfiche. Environmental Protection Agency Water Pollution Control Research Series October, 1971, 59 p, 11 fig, 8 tab, 32 ref. EPA Program 14010 FUI--10/71.

Descriptors: *Foam separation, *Froth flotation, *Tertiary treatment, Separation techniques, Metals, Surfactants, Foaming, Bubbles, Adsorption, Coagulation, Surface tension, Technical feasibility, Economic feasibility, *Waste water treatment, *Mine drainage, Acid mine water.

Laboratory studies of continuous flow foam separation were conducted to determine the optimum conditions for maximum extraction of dissolved metal cations (Fe, Ca, Mg, Mn, and Al) from acid mine drainage. Foaming experiments were conducted in a 6 in.-diameter glass column capable of liquid flow rates of 3-12 gal. per hour. The approach to foam separation taken was the production of the persistent foams which allowed protracted foam drainage to reduce liquid carryover in the foam. The effects of pH, chelate addition, surfactant type and concentration, air sparging rate, metal concentration and foam drainage were investigated in relation to metal extraction. The average extraction rate obtained was 1.9 x 10-7 moles total metal per cm2 column cross-section area per minute which is approximately 4.0 x 10-7 equivalents per cm2 per minute. Operation in simple and countercurrent foaming modes produced similar extraction rates for acid mine drainage. Results show that sewage foamability is too low for foam separation alone to be a feasible sewage treatment method. However, foam separation with froth flotation for treating primary and secondary effluents has removed as much as 70% of the COD, 90% of the phosphates, and 40-80% of the suspended solids. In addition, the foam separation-froth flotation system uses fewer chemicals and therefore can be more competetive economically. (Lowry-Texas)
W72-07102

FEASIBILITY STUDIES OF APPLICATIONS OF CATALYTIC OXIDATION IN WASTEWATER.
Southern Illinois Univ., Carbondale.

Copy available from GPO Sup Doc, $0.75; microfiche from NTIS as PB-208 348, $0.95. Environmental Protection Agency Water Pollution Control Research Series, November 1971, 67 p, 31 fig, 7 tab, 21 ref. EPA Program 17020 ECI--11/71.

Descriptors: *Ultrasonics, Catalysts, *Ozone, Tertiary treatment, Performance, Optimization, Research and development, Laboratory tests, Analytical techniques, *Oxidation, Phenol, Temperature, *Waste water treatment.
Identifiers: *Sonocatalytic oxidation, *Catalytic oxidation, *Catalytic ozonation, Ozonation, Insonation, Nickel.

The recent discovery of the synergistic effects of certain catalysts and ultrasound (sonocatalysis) prompted research investigating the feasibility of using sonocatalysis for advanced wastewater treatment. Sonocatalytic oxidation, sonocatalytic ozonation, and catalytic ozonation were tested individually on treatment plant effluent, and mechanistic studies of sonocatalysis were conducted concurrently using synthetic wastes. Insonation, activated Raney-Nickel catalyst, and air flow produced removals of 78%, 96%, and 100% of COD, Oxygen Demand Index (ODI), and coliforms, respectively, from treated wastewaters. Catalytic ozonation alone was shown to provide 65% COD and 60% TOC removals from treated wastewaters in two hours. Synethetic wastes of phenol and orthochloronitro benzene (OCNB) were prepared and sonocatalytic ozonation of the phenol resulted in a rapid phenol decrease, a less rapid COD decrease and a still slower TOC decrease. The phenol appeared to undergo a stepwise conversion to intermediates at higher oxidation states during slow conversion to carbon dioxide and water. Neither catalytic oxidation nor sono-oxidation of OCNB occurred at room temperature but the sonocatalytic oxidation combination was able to remove all traces of the compound from aqueous solutions. No cost estimate for the process application to secondary effluent was developed. (Lowry-Texas)
W72-07103

OXYGEN CONSUMPTION IN CONTINUOUS BIOLOGICAL CULTURE.
Kansas Univ./Center for Research, Inc., Lawrence.

Copy available from GPO Sup Doc, $1.25; microfiche from NTIS as PB-208 349, $0.95. Environmental Protection Agency Water Pollution Control Research Series, May 1971, 130 p, 33 fig, 30 tab, 45 ref. EPA Program 17050 DJS--05/71.

Descriptors: *Activated sludge, *Aeration, *Sludge, Laboratory tests, Sampling, Monitoring, Respiration, Organic loading, Design criteria, Mathematical models, *Waste water treatment, Oxygenation.
Identifiers: *Step input, *Mean residence time, *Transients, Synthetic wastes, Glucose, Oxygen consumption.

Responses of laboratory scale aeration only and aeration with sludge return completely mixed activated sludge (CMAS) systems to step changes in the influent substrate were determined using a continuous flow automatic recording respirometer. Substrates included: glucose; a mixture of glucose, glutamate, and acetate; and a mixture of sewage solids plus Metrecal. Doubling the substrate influent to an aeration only CMAS with a 3 hour detention time produced no changes in effluent soluble COD, and tripling the influent mixture to a similar reactor with a 6 hour mean residence time also produced no measureable variation in effluent soluble COD. Within 3 hours of starting the transients to system 1, and within 5 hours of the introduction to unit 2, the systems were again operating at steady state. A CMAS system with sludge recycle was loaded up to 7.2 times the original loading in step increments with no transient increases in effluent soluble COD. However, the system was not loaded to failure, so no maximum loading was established. A mathematical model was then formulated to predict the oxygen consumption in CMAS systems, both aeration only and aeration with sludge recycle. Comparison of predicted and observed values showed good agreement during the first 6 hours of a transient, after which the assumption that all of the biological solids synthesized remain in the reactor causes the predicted values to be high. A glossary and bibliography are included. (Lowry-Texas)
W72-07104

FUTURE GROWTH OF THE POTATO PROCESSING INDUSTRY,
Simplot (J. R.) Co., Caldwell, Idaho.
Ray W. Kueneman.
In: Potato Waste Treatment, Proceedings of symposium sponsored by FWPCA and Idaho University, March 1968, p 73-80.

Descriptors: *Potatoes, *Vegetable crops, *Food chains, Human population, Water consumption, Forecasting, Planning, Industrial wastes, *Food processing industry, *Waste water treatment.
Identifiers: *Processing.

Potatoes represent 20% of the total vegetable production in the United States, with a current annual production of 12.5 million metric tons. In Poland, where 37.8 million metric tons are grown annually, 6.5 million metric tons are consumed fresh, 23.3 million metric tons are used as feeds, 5.4 million metric tons as seeds, and 3.2 million metric tons are used in industry for starch and alcohol production. In a recent study on the consumption of frozen potatoes, it was discovered that per-capita consumption of frozen potatoes had risen from 8.35 lbs in 1967 to 9.38 lbs in 1968, and projected consumption for 1976 is 18.20 lbs. Other processed potatoes are continuing to increase in popularity also, and if losses in processing continue to average 25% of the fresh potatoes processed, then the potato industry of 1976 will have to process 1.85 million tons to meet the 1976 demand. The nearly 1/2 million tons of wastes produced must be reduced, re-used, or disposed

of, and the time for developing the technology to do so is at hand. (See also W72-06852) (Lowry-Texas)
W72-07105

DEVELOPMENT AND RESEARCH INTO PULP AND PAPER WASTE TREATMENT IN FRANCE,
Degremont, Rueil (France).
J. Bebin.
Pulp and Paper Magazine of Canada, Vol 71, No. 10, May 15, 1970, Technical Paper T215, p 53-56.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Research and development, Colloids, Color, Hydrogen ion concentration, Suspended solids, Sulfite liquors, Ion exchange, Reverse osmosis, Flocculation, Mixing, Electrolysis, Bubbles, Flotation, Chemical precipitation, Activated sludge, Aerated lagoons, Sludge disposal, Centrifugation, *Waste water treatment, *Foreign research.
Identifiers: *Decantation, *Thermal conditioning.

The bulk of research for the entire paper industry in France is performed by the 'Centre Technique du Papier', but certain individual mills also operate some research facilities. Much of the research has been stimulated by the imposition of taxes by the various water shed authorities on both water usage and effluent discharges of industrial plants. Major characteristics of pulp and paper wastes include residual color, fibers, fluctuating pH, high sulfite concentrations, and high concentrations of organics. Processes currently being investigated include: (1) decantation with chemical addition to remove up to 95% of the settleable solids; (2) flotation with electrolytically produced air bubble for solids removals; and (3) two stage biological treatment for BOD and sulphite removals. Other areas of investigation include ion exchange for color removal, reverse osmosis for water re-use applications, and aerated lagoons for reduction of organics. Sludge disposal also is being investigated since many of the processes produce sludge which is difficult to dewater, with current efforts proceeding mainly in centrifugation and thermal conditioning. (Lowry-Texas)
W72-07106

RUBBER.
National Industrial Pollution Control Council, Washington, D.C. Rubber Sub-Council.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402 Price $0.20. Sub-Council Report, October, 1971, 15 p, 4 fig, 9 ref.

Descriptors: *Rubber, *Industrial wastes, *Air pollution, Sulfur compounds, Odors, Solid wastes, Landfills, *Waste water treatment, Water pollution sources, Water quality control.
Identifiers: *Tires, *Recycling, *Particulate emissions.

The rubber industry, a 16-billion dollar per year enterprise employing nearly 500,000 people, supplies a demand for rubber products that has risen to 30 lbs of rubber per capita per year. Steps taken by the industry to reduce environmental pollution include: (1) research and development programs aimed at finding a subsequent use for the 200 million tires worn out annually in the U. S.; (2) conversion of coal-burning boilers to cleaner burning oil or natural gas; (3) new or improved process water treatment methods; (4) odor elimination; and (5) solid waste control. Worn out tires are being used for: (1) reduction to carbon black for use as an ingredient in making new tires; (2) manufacture of artificial grass; (3) particulate segments of road surfacing materials; and (4) construction of artificial barrier reefs for the promulgation of sea life. The industry-wide Rubber Manufacturers Association Environment Committee is involved in the pooling and interchanging of needed technical information to obtain comprehensive and continuing results. (Lowry-Texas)
W72-07107

NITROGEN REMOVAL FROM MUNICIPAL WASTE WATER BY COLUMNAR DENITRIFICATION,
Environmental Protection Agency, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. M. Smith, A. N. Masse, W. A. Feige, and L. J. Kamphake.
Environmental Science and Technology, Vol 6, No. 3, March 1972, p 260-267, 9 fig, 5 tab, 13 ref.

Descriptors: *Municipal wastes, *Denitrification, *Nitrification, Nitrates, Ammonia, Nitrogen, Oxidation-reduction reactions, Slime, Aerobic conditions, Anaerobic conditions, Depth, Dissolved oxygen, Inhibition, Filtration, Cost analysis, *Waste water treatment.
Identifiers: *Surface loading rates, *Contact times, Methanol.

Pilot scale studies of columnar denitrification, using methanol as a substrate for the biochemical reduction of the nitrate ion, were conducted on the nitrified effluent of a municipal waste treatment plant. Various sizes of media were used, and over 90% denitrification was achieved at methanol/nitrate ratios of 2.50/1 and 2.75/1 at contact times of 5 minutes for 3.40 mm median diameter sand and 15 minutes for 3/4 in. median diameter stone, with both runs being operated at a surface loading rate of 7.0 gpm/ft2. Advantages of the columnar system included the high equivalent concentration of slime per volume, the intimate contact afforded by the large surface area, elimination of secondary clarification and sludge recycle, shorter contact times, the fact that the denitrification column could be used as a tertiary filter, and the placing of the nitrogen removed during the process back into the ecosystem as elemental nitrogen. Chemical costs to remove 20 mg/l of nitrate-nitrogen in the presence of 6 mg/l of dissolved oxygen at a 2.75 to 1 methanol to nitrogen ratio will be 1.9 cents/1000 gallons. No construction or operational costs were reported. (Lowry-Texas)
W72-07108

PILOT SCALE THICKENING OF CLARIFIER SLUDGES FROM A NEWSPRINT MILL,
The Ontario Paper Co. Ltd., Thorold (Ontario).
W. F. Fell, A. Tomiak, and J. L. Smith.
Pulp and Paper Magazine of Canada, Vol 71, No. 10, May 15, 1970, Technical Paper T 225, p 62-68, 3 fig, 4 tab.

Descriptors: *Pulp wastes, *Clarification, *Sludge disposal, Dewatering, Centrifugation filtration, Pilot plants, Cost comparisons, Operating costs, Installation costs, Pulp and paper industry, Separation techniques, *Waste water treatment.
Identifiers: *Wood fibers, *Suspended solids.

Addition of a clarifier for suspended solids removals at the Thorold, Ontario mill of the Ontario Paper Company, Ltd., prompted a search for an economical thickening device. A trial comparison of a belt filter and a solid bowl centrifuge was conducted on a pilot scale. Units tested were a 3 ft by 1 ft Eimco belt filter and a Sharples P-3000 Super-D-Canter centrifuge. The pilot scale information was used to determine full scale criteria concerning cake dryness, cost of final installation, and cost of a operation. During the final three weeks of the experimentation, with both units receiving the same sludge of 3.66% consistency, average consistency of the filter was 25.3% and average consistency out of the centrifuge was 25.1%. Although the performance figures were nearly equal, cost of installation of an 8 ft diameter by 8 ft belt filter, the size required for the job, was $47,000, compared to $68,000 for a comparable size centrifuge. Yearly operational costs for the centrifuge were $10,000 higher also. Therefore, the belt filter was chosen for installation. (Lowry-Texas)
W72-07109

BIOLOGICAL OXIDATION OF COKE PLANT WASTE,
Armco Steel Corp., Middletown, Ohio.
J. E. Barker, and R. J. Thompson.
Preprint, Chicago Regional Technical Meeting, American Iron and Steel Institute, October 14, 1971. 24 p. EPA Program 12010 EDY--10/71.

Descriptors: *Steel, *Waste water treatment, Biological treatment, Ammonia, Phenol, Chemical oxygen demand, Tertiary treatment, *Imdustrial wastes, Coals, Industrial plants, Pilot plants, Nitrification, Denitrification, Ammonia.
Identifiers: *Coke, *Ammonia liquor, Cyanide, Thiocyanate.

A one-year study using a 1-g/m pilot plant for biological treatment of coke plant ammonia liquor was conducted. The first process was used to oxidize carbon compounds, the second process oxidized ammonia to nitrate, and the final process reduced nitrogen to nitrogen gas. Overall design was a completely mixed activated sludge system. Treatment removal efficiencies averaged 99.9 percent phenol, 80 percent COD, 90 percent ammonia, 57 percent cyanide, and 17 percent thiocyanate. Waste strength and variabilities are reported. (EPA abstract)
W72-07120

EFFECTS OF DETENTION TIME ON AEROBIC SLUDGE DIGESTION OF PRIMARY SLUDGE,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
E. E. Cook, Q. B. Graves, Y. A. Badra, and D. Scott.
Mimeo, 1971. 19 p, 12 fig, 3 ref. EPA Program 17070 DAU--00/71.

Descriptors: *Sludge digestion, *Sewage sludge, *Aerobic treatment, Sludge treatment, Sewage treatment, Domestic wastes, Waste disposal, Anaerobic digestion, Waste water treatment.
Identifiers: *Aerobic sludge digestion, Digestion of primary sludge, Digestion of mixed primary and secondary sludge, Digestion of secondary sludge.

In an effort to decrease the time required for sludge digestion, research was directed towards aerobic digestion in opposition to anaerobic digestion. Sludge was retained in aerobic digesters for 2, 4, 8 or 12 days. Air was supplied through diffusers in the bottom of the digesters at the rate of 88cfm/1000 cu ft of digester space. The digesters were 180 gallon plastic tanks, each placed inside a 250 gallon tank. Heating or cooling water pumped through the bottom of the outside tank maintained a temperature of 25 deg C in the aerobic digesters. Data were collected on the COD, total solids, volatile solids, ammonia nitrates and phosphates. Considering all parameters, the 4-day detention time out-performed the other detention times in each parameter considered except COD. A longer detention was needed to reduce the COD to a low level.
W72-07121

BIOLOGICAL DEGRADATION OF TERTIARY BUTYL ALCOHOL,
Robert S. Kerr Water Research Center, Ada, Okla.
J. A. Horn, J. E. Moyer, and J. H. Hale.
Paper presented at 25th Annual Purdue Industrial Waste Conference, Lafayette, Indiana, May 1970. 31 p, 6 fig, 10 tab, 6 ref. EPA Program 12020-05/70.

Descriptors: *Activated sludge, *Chemical wastes, Bacteria, *Biological treatment, Design, Chromatography, Biochemical oxygen demand, Chemical oxygen demand, Alcohols, Waste water treatment.
Identifiers: *Refractory chemicals, Materials balance, Carbon analysis, *Acclimation.

Long term (8 weeks) microbial acclimation by the enrichment culture method was employed to develop a culture capable of biodegrading tertiary

butyl alcohol. During bench-scale studies in continuous-feed completely-mixed reactors, the activated sludge biomass removed 85-98 percent of the TBA substrate. Substrate concentrations expressed as carbon and reactor detention times were respectively 400-1800 mg/l and 1-4.3 days. Unit carbon loadings varied from 0.12 to 0.27 lbs. carbon/day/lb. MLVSS. The results of 'evolved gas' analyses substantiated by a carbon materials balance illustrated that at least 99 percent of the TBA removal occurring was due to biodegradation rather than airstripping. The presence of more readily-degradable carbon substrates in both synthetic and actual wastes did not interfere with TBA metabolism. (EPA abstract)
W72-07125

1971 NEW PRODUCTS REVIEW.
For primary bibliographic entry see Field 05G.
W72-07130

BIODEGRADATION OF SYNTHETIC DETERGENTS EVALUATION BY COMMUNITY TRIALS, PART 2: ALCOHOL AND ALKYLPHENOL ETHOXYLATES,
Shell Research Ltd., Egham (England). Egham Research Lab.
A. H. Mann, and V. W. Reid.
Journal of the American Oil Chemists' Society, Vol. 48, No. 12, p 794-797, December 1971. 1 fig, 3 tab, 16 ref.

Descriptors: *Biodegradation, *Detergents, *Alcohols, *Effluents, Sewage treatment, Acclimatization, Activated sludge, Sewage bacteria, Aeration, Seasonal, Fluctuation, Summer, Foaming, Chromatography, Chemical properties, Bacteria, Trickling filters, Alkylbenzene sulfonates.
Identifiers: *Ethoxylates, Iso-octylphenol, Thin layer chromatography, Alkyl sulfates, Cobalti-thiocyanate, Dobanol, Neodol, Nonidet P 40, Nonidet P 100, Alkyl ethoxylate, Dobanol 25-9, Dobanol 91-8, Alkylphenol ethoxylates, Alcohol ethoxylates.

Published evidence concerning the biodegradability of branched chain alkylphenol ethoxylates is conflicting. Variation in results is probably due to insufficient bacterial acclimation and failure of the cobalti-thiocyanate method to respond to the biodegradation intermediates which still show substantial foaming and other surface activity. In order to establish the order of biodegradation, ethoxylate derivatives of synthetic primary alcohols and iso-octylphenol were evaluated under practical trickling filter sewage treatment conditions with established bacterial acclimatization. Biodegradation was determined by methods used in an earlier study. Thin-layer chromatography was employed for determining trace quantities of nonionics in the influent and effluent streams. Synthetic alcohol ethoxylates showed good biodegradability in the trickling filter even in winter, which is in line with laboratory tests. Effluents were practically nonfoaming and on further aeration an ultimate biodegradability of 99 percent was achieved. Ethoxylates based on iso-octylphenol biodegraded in winter to an extent of some 20 percent only. In summer, values as high as 80 percent were obtained. In general however ethoxylates of this type cannot be considered biodegradable. Effluents containing residual alkylphenol ethoxylate showed considerable tendency to foam even in summer (10-12 cm foam height). Those with only residual alkyl sulfate or alkyl ethoxylate were practically nonfoaming (0-2 cm foam height). (See also W72-07149) (Snyder-Battelle)
W72-07148

BIODEGRADATION OF SYNTHETIC DETERGENTS EVALUATION BY COMMUNITY TRIALS, PART 3: PRIMARY ALCOHOL SULPHATES,
Shell Research Ltd., Egham (England). Egham Research Labs.
A. H. Mann, and V. W. Reid.
Journal of the American Oil Chemists' Society, Vol. 48, No. 12, p 798-799, December 1971. 2 tab, 2 ref.

Descriptors: *Biodegradation, *Detergents, *Effluents, Alcohols, Aeration, Activated sludge, Foaming, Sewage treatment, Phenols, Biochemical oxygen demand, Trickling filters, Surfactants, Salts, Sodium.
Identifiers: *Alcohol sulfates, Coconut alcohol, Synthetic alcohol, Dobanol 25, Neodol, Alkyl sulfates, Triethanolamine.

Field and continuous laboratory tests were performed to evaluate the biodegradability in activated sludge of two primary alcohol sulfates derived from a coconut alcohol and a synthetic alcohol (Dobanol 25). The field tests were conducted at a small trickling-filter sewage treatment plant by the Water Pollution Research Laboratory. Sampling and analyses were performed according to methods established in previous studies. The alkyl sulfates used in the tests were in the form of their sodium or triethanolamine salts. Tabulated data show that both materials are highly biodegradable (95-98 percent) and laboratory tests indicate that both products are almost completely biodegradable (99 percent), with temperature having little influence on the degree of biodegradation. On aeration of effluents in the laboratory, further degradation to 99 percent was achieved with both alcohol sulphates. An evaluation of the foaming tendency of effluents showed that those containing only residues of either alcohol sulphate were practically nonfoaming. (See also W72-07148) (Snyder-Battelle)
W72-07149

PRESSING OUT THE LAST BIT OF POLLUTION.

Chemical Week, Vol 110, No 7, p 31-32, February 16, 1972.

Descriptors: *Waste water treatment, *Filtration, *Organic wastes, Industrial wastes, Oily waters, Separation techniques, Membrane processes, Coalescence, Costs, Water pollution control, Screens, Oil, Suspended load, Sediments.
Identifiers: Coalescer filtration unit.

A coalescer filtration unit has been developed which shows promise of removing all insoluble organic matter from waste water. A 1-foot square, 7.5-gal/minute filter has been removing 100 percent of insolubles (primarily oil) in a test on a steel plant's effluent. Waste water containing less than 100 ppm of organic constituent is passed through a filter-press assembly with a glass-fiber bed. Water and organic material emerge from the assembly as separate streams. The assembly's membrane is formed from phenol-formaldehyde-coated glass fiber and consists of three layers. A second stage screen barrier is made from 100-mesh monel screen coated with 0.005 in. of Teflon. Waste water is filtered and sieved before entering the assembly to reduce insolubles to 100 ppm and remove large drops of oil. The process is not applicable to soluble matter, but the developers are optimistic about finding a solvent to accomplish this. Potential application of the process to specific pollutants, such as heavy metals or phenols, has not yet been determined. The process also may have applications beyond waste water treatment, such as separation of water from chemicals during processing. (Mortland-Battelle)
W72-07172

ECONOMIC ASPECTS OF THERMAL POLLUTION CONTROL IN THE ELECTRIC POWER INDUSTRY,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05G.
W72-07246

EVALUATION OF WASTE TREATMENT SYSTEM: CHEMAWA INDIAN SCHOOL,
Pacific Northwest Water Lab., Corvallis, Oreg.
B. David Clark, and Kenneth A. Dostal.
Available from the National Technical Information Service as PB-208 435, $3.00 in paper copy, $0.95 in microfiche. Report No FR-6, July 1968. 62 p, 7 fig, 16 tab, 7 ref, 3 append. FWPCA Program 17050---07/68.

Descriptors: *Waste water treatment, *Aerated lagoons, Oregon, *Biochemical oxygen demand, *Sampling, Aeration, Chlorination, Water pollution sources, Oxygen demand, Spraying, Data collection, Operating costs, Maintenance costs.
Identifiers: *Chemawa (Ore), Polishing ponds, Waste characterization, *Aerator, Supplemental aeration.

The Bureau of Indian Affairs (BIA) operates a nine month school for 900-1,000 Indians at Chemawa, approximately two miles north of Salem, Oregon. The waste treatment plant for the school is unique in this area, consisting of a facultative mechanically aerated lagoon followed by a two-acre polishing pond and chlorination. A sampling program was established to determine raw waste load and characteristics; solids and BOD removal in aerated lagoon; sludge accumulation in aerated lagoons; MPN level in aerated lagoons; Adequacy of aerator for mixing and oxygenation; effect of polishing pond on BOD, DO, MPN and SS; effect of chlorination on BOD, DO, MPN and SS; and operation and maintenance costs and requirements. Conclusions were: complete-mix kinetics can be used with the survey data to predict closely the actual aerated lagoon BOD5 removal efficiency using a BOD5 removal rate of 0.034/day and a value of 1,035 as the constant in the Van't Arrhenius temperature correction equation. The aerated lagoon mechanical aerator is sufficient for oxygen dispersion, but inadequate to meet the oxygen demand at all expected operating conditions. At the present BOD5 loading level of 230 lb/day, the aerator will not provide sufficient oxygen at temperatures above 17 degrees C. With an increase in BOD5 load of 25 percent, the maximum operating temperature is reduced to 11 degrees C. The supplemental spray aeration system provides a minimal quantity of oxygen per day on the basis of theoretical calculations. It is recommended that the aerated lagoon be increased to prevent development of anaerobic conditions, and that further study of the aerated lagoon be carried out to confirm temperature and BOD5 removal relationships.
W72-07247

EVALUATION OF EXTENDED AERATION TREATMENT AT RECREATION AREAS, PROGRESS REPORT,
Pacific Northwest Water Lab., Corvallis, Oreg.
B. David Clark.
Available from the National Technical Information Service as PB-208 436, $3.00 in paper copy, $0.95 in microfiche. Working Paper No 68, Report No PR-8, March 1970. 90 p, 13 fig, 32 tab, 21 ref, append. FWPCA Program 15010---03/70.

Descriptors: *Recreation facilities, *Winter sports, *Aeration, *Parks, *Waste water treatment, *Activated sludge, *Design criteria, Oregon, Washington, Water pollution sources, Organic loading, Filtration, Tertiary treatment.
Identifiers: *State Parks, *Summer sports, *Extended aeration, Sunset Bay St Park (Ore), Crystal Mt. (Wash), Mt. Hood (Ore).

The objectives are to define basic waste characteristics from recreation areas, evaluate existing treatment processes and to develop a guide for the planning and design of wastewater treatment facilities at recreation areas. The two winter recreation areas included Timberline Lodge on Mt. Hood, approximately 50 miles east of Portland, Oregon, and Crystal Mountain Ski Area near Mt. Rainier National Park, approximately 50 miles east of Tacoma, Washington. The two summer areas included Sunset Bay State Park, also on the oregon coast, approximately five miles north of Bandon. Conclusions were: Overall design of extended aeration activated sludge systems treating

the highly variable recreation wastewater will result in low organic loadings during low flow periods that may result in an inefficient system due to pH problems, nitrification-denitrification, reduced organic removal rate, and a highly dispersed aeration sludge with poor settling characteristics. A peak flow rate, on the order of 10 times the average daily flow, should be considered in the design of final clarifiers treating recreation wastewaters due to the possibility of carryover of suspended solids at the higher peak flow rates. The organic removal rate in terms of COD is highly dependent on stable pH conditions in the aeration basin of a biological system and may be severely reduced if conditions are not stable. The sludge synthesis ratio is not seriously affected by unstable low pH conditions. It is recommended that, where secondary treatment is the desired standard, the use of extended aeration activated sludge systems for the treatment of recreation wastes be discouraged unless adequate assurance can be given that the plant will be properly operated and maintained, including proper sludge wasting facilities and/or an adequately designed solids removal process is added to the system either in the form of a polishing pond or a filtration unit. (See also W72-07249)
W72-07248

BASIC WASTE CHARACTERISTICS AT WINTER RECREATION AREAS, PROGRESS REPORT,
Pacific Northwest Water Lab., Corvallis, Oreg.
B. David Clark.
Available from the National Technical Information Service as PB-208 437, $3.00 in paper copy, $0.95 in microfiche. Report No PR-7, January 1969. 84 p, 12 fig, 14 tab, append. FWPA Program 15010---01/69.

Descriptors: *Recreation facilities, *Skiing, *Winter sports, *Design criteria, *Organic loading, *Solid wastes, *Waste water treatment, *Regression analysis, Oregon, Washington, Water pollution sources, Treatment facilities.
Identifiers: Crystal Mt. (Wash), Mt. Hood (Ore), Bachelor Butte (Ore).

Findings are summarized of surveys at three winter sports areas to determine basic wastewater characteristics and recommend criteria for use in the design of treatment facilities. The study was conducted over the 1967-68 recreation season from approximately December 1967 to May 1968. The three sites selected were Crystal Mountain Ski Area near Mt. Rainier National Park in the State of Washington, Timberline Lodge on Mt. Hood, approximately 50 miles east of Portland, Oregon and Bachelor Butte Ski Area approximately 20 miles west of Bend, Oregon. The quantity of various wastewater parameters discharged is a linear function of number of full-time employees, and either or both total visitors and overnight guests depending on the facilities. This relationship was verified by multiple linear regression analysis techniques. Statistically significant but highly variable relations were developed for COD, BOD5, suspended solids, total nitrogen, and total phosphates. It is recommended that the maximum value of the 95 percent confidence limit be used in selecting design values. Methods for estimating design organic loading and design solids loading were developed. (See also W72-07248).
W72-07249

HOUSEBOAT WASTE CHARACTERISTICS AND TREATMENT,
Pacific Northwest Water Lab., Corvallis, Oreg.
B. D. Clark.
Available from the National Technical Information Service as PB-208 438, $3.00 in paper copy, $0.95 in microfiche. Report No PR-6, September 1967. 33 p, 2 fig, 9 tab, 11 ref. FWPCA Program 15020---04/68.

Descriptors: *Waste water treatment, *Recreation, *Boating, Biochemical oxygen demand, *Aerobic treatment, Aeration, Suspended solids. Identifiers: *Houseboat wastes, Total grease and oil.

The average per capita BOD5 and per capita suspended solids (SS) in houseboat wastes is 43 plus or minus 3 (95% confidence limits) gm/day and 34 plus or minus 7.1 gm/day, respectively. The average per capita total grease and oil in the houseboat waste is 17.4 plus or minus 7.7 gm/day. This value is higher than normal domestic sewage and waste from the average land residence. Small extended aeration biological treatment units offer a practical means of economically providing secondary treatment for houseboat wastes. A study made in Canada indicates the applicability of these units for individual home application. Use of conventional design values of 0.17 pounds (77 gm) of BOD5 and 0.2 pounds (90 gm) of SS per capita per day would provide a conservative design of biological treatment facilities for houseboat and moorage wastes. The average daily 18-hour per capita flow of 75 gpd with a minimum retention time of 24 hours should be used in hydraulically sizing treatment aeration tanks. A maximum 3-hour flow rate of 700 gpcd should be used to size settling compartments and inlet-outlet devices. The alkalinity contributed by the houseboat may be insufficient to maintain optimum pH conditions in aerobic biological treatment units. Addition of a buffering solution may be necessary. (See also W72-07251)
W72-07250

HOUSEBOAT WASTES: METHODS FOR COLLECTION AND TREATMENT,
Pacific Northwest Water Lab., Corvallis, Oreg.
B. D. Clark.
Available from the National Technical Information Service as PB-208 439, $3.00 in paper copy, $0.95 in microfiche. June 1967. 84 p, 15 fig, 7 tab, 10 ref, 2 append. FWPCA Program 15020---06/67.

Descriptors: *Waste water treatment, *Recreation, *Boating, *Aerobic treatment, Pumping, *Disinfection, Costs, *Aeration, Oregon, Washington, California.
Identifiers: Portland (Ore), *Houseboat wastes.

The study area included the States of Washington, Oregon, and California which have over 1200 houseboats and many other floating structures requiring sewage collection and treatment facilities. Average daily houseboat wastewater quantities are similar to those for normal land residences with a daily per capita flow of 75 gpd. The average 16-hour flow is also similar with a per capita flow rate of 95 gpd. Central collection of all wastes is recommended wherever possible requiring that moorages provide central collection facilities for houseboat wastes and wastewaters from other floating structures. Pumping all wastes to a shore sewer is the least expensive and most practical alternative wherever this is possible. Individual treatment devices including macerator-chlorinator toilets, incinerator toilets, septic tanks with soil absorption fields, and aerobic extended aeration units were considered. Aerobic biological treatment units with disinfection facilities would provide satisfactory treatment; costs for a floating unit would range from $1800 to treat the wastes from a single houseboat, to $200 per houseboat for the wastes from 50 houseboats. Primary settling with sludge removal facilities and chlorination of the effluent could be considered as an interim method of treatment. A system adequate to serve up to 25 to 35 houseboats could be fabricated for $500 to $700, excluding labor costs. A system design with three alternatives was made for a typical moorage in the Portland, Oregon, area. The design considered: (1) pumping with centrifugal pumps from each houseboat to a lift station for further lifting to a city sewer, (2) pumping with centrifugal pumps directly to a city sewer from each houseboat, and (3) pumping with pneumatic ejectors to a floating treatment facility. The cost to the individual houseboat owner for each plan was $935, $1560, and $1460, respectively. The first cost to the moorage owner for each plan was $7500, $4600, and $8700, respectively. These figures do not include annual costs for financing, operation, and maintenance. (See also W72-07250)
W72-07251

5E. Ultimate Disposal of Wastes

WATER POLLUTION CONTROL LEGISLATION, OCEAN DUMPING, PART 5.
Congress, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-06634

SUBSURFACE DISPOSAL OF WASTE IN CANADA,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
R. O. Van Everdingen, and R. A. Freeze.
Technical Bulletin No 49, 1971. 64 p, 7 fig, 3 tab, 188 ref, 2 append.

Descriptors: *Waste disposal, *Injection wells, *Ecology, *Water pollution control, Legal aspects, Abatement, Standards, Governments, Regulation, Reviews, Environmental sanitation, Industrial wastes, Subsurface investigation.
Identifiers: *Canada.

A discussion of the qualification of waste for subsurface disposal in Canada is followed by a review of the criteria to be applied for the proper selection of disposal regions, sites, and geologic formations, and chapters on subsurface-disposal facilities. After a review of the status of the method, requirements in the field of legislation and regulation are outlined, followed by a discussion of those aspects of the method that are most in need of further research. Through subsequent legislation and regulation it should be possible to avoid the costly mistakes, serious accidents and often irreversible damage to the environment that can result from subsurface disposal operations that are hastily conceived, inadequately investigated, improperly equipped, and insufficiently monitored. A bibliographic list of 188 pertinent articles is included. (Woodard-USGS)
W72-06776

DISPOSAL OF WATER WORKS WASTES,
American Water Works Association Research Foundation, New York.
For primary bibliographic entry see Field 05D.
W72-06816

DISPOSAL OF WATER TREATMENT PLANT WASTES.
American Water Works Association, New York.
For primary bibliographic entry see Field 05D.
W72-06817

SELECTION OF DISPOSAL METHODS FOR WATER TREATMENT PLANT WASTES,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 05D.
W72-06820

LAGOON DISPOSAL OF LIME SLUDGE,
Alvord, Burdick and Howson, Chicago, Ill.
For primary bibliographic entry see Field 05D.
W72-06821

SLUDGE REMOVAL AND DISPOSAL,
Miami Dept. of Water and Sewers, Fla.
For primary bibliographic entry see Field 05D.
W72-06823

UTILIZATION AND DISPOSAL OF CRAB AND SHRIMP WASTES,
Alaska Univ., College. Cooperative Extension Service.
For primary bibliographic entry see Field 05D.
W72-06861

DEEP WELLS FOR INDUSTRIAL WASTE INJECTION IN THE UNITED STATES--SUMMARY OF DATA,
Federal Water Pollution Control Administration, Cincinnati, Ohio.
D. L. Warner.
Available from the National Technical Information Service as PB-208 220, $3.00 in paper copy, $0.95 in microfiche. Water Pollution Control Research Series. Publication WP-20-10,mber 1967. 45 p, 1 fig, 1 tab, 31 ref. EPA Program 17070--11/67.

Descriptors: *Waste disposal wells, *Industrial wastes, *Injection wells, *Industrial plants, Liquid wastes, Oil industry, United States, Water pollution sources, Chemical wastes, Geologic formations, Bibliographies, Statistics, Well data.
Identifiers: Refinery wastes, Pharmaceutical plant wastes, Deep well injections.

The publication lists 110 industrial waste injection wells located in 16 states and gives some of their characteristics. Data include operator, location, date operation was begun, well depth, injection depth, rock type and the geological age, chemical and physical character of the injected waste, injection rate and pressure, and the source of information. A statistical analysis of the well data is given in a table, and a graph shows the number of wells placed in operation from 1950 to January 1967. About 82% of the injections wells are used by chemicals, petrochemical, and pharmaceutical products plants; refineries and natural gas plants; and metal products companies. (Lang-USGS)
W72-06907

EXPLOITATION OF MINERALS IN DISPOSAL BRINES,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 05D.
W72-06915

OPPORTUNITIES AND PLANS FOR SEWAGE RENOVATION ON FOREST AND WILDLANDS IN MICHIGAN,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 05D.
W72-06949

PUBLIC INTEREST IN THE LOCATION OF PUBLIC FACILITIES,
Chicago Univ., Ill. Center for Urban Studies.
For primary bibliographic entry see Field 06B.
W72-06962

DISPOSAL OF VAULT WASTES, LAKE OUACHITA AND LAKE GREESON, ARKANSAS,
Waterways Experiment Station, Vicksburg, Miss.
J. Harrison.
Miscellaneous Paper Y-72-1, March 1972. 10 p, 1 tab, 2 plate.

Descriptors: *Sewage disposal, *Water pollution, *Waste disposal, *Sewage treatment, Sewage lagoons, Arkansas.
Identifiers: *Lake Greeson (Ark), *Lake Ouachita (Ark).

A temporary solution (i.e., satisfactory for up to 5 years) was sought for disposal of the Lake Ouachita and Lake Greeson wastes. There are approximately 130,000 gal/year of wastes with an average Biochemical Oxygen Demand (BOD) of approximately 8800 mg/l. Possible treatment methods include: (a) insertion into an existing sewage treatment system, (b) package sewage treatment plants, (c) package plants preceded by a sewage lagoon, (d) sewage lagoons, (e) absorption trenches, (f) sewage irrigation, and (g) burial. Use of the liquefying/oxidizing agent ZEP-O-ZYME was studied and found to be beneficial. Although (a) is the most economical solution, while meeting all health requirements, it was expressly forbidden by local authorities. The most feasible solution approved by the State of Arkansas was treatment by a method of land disposal: either absorption trenches, irrigation, burial, or a combination thereof. Such methods meet all problem requirements while maintaining flexibility for future contingencies. (CE)
W72-06990

5F. Water Treatment and Quality Alteration

APPARATUS FOR WATER PURIFICATION BY ION EXCHANGE,
Corning Glass Works, Bradford, Pa. (Assignee).
James R. Lindenthal, and Richard H. Winn.
U. S. Patent No. 3,497,069, 2 p, 1 fig, 4 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 4, p 1151, February 24, 1970.

Descriptors: *Patents, *Water purification, *Ion exchange, Separation techniques, Resins, *Water treatment, Methodology.
Identifiers: Chemical treatment.

Impure water is passed successively through layers of a strong acid cation exchange resin, a weakly basic anion exchange resin, a second layer of strong acid cation exchange resin, a second layer of weakly basic anion exchange resin, a strongly basic anion exchange resin, and lastly through a layer consisting of a mixture of strong acid cation exchange resin and strongly basic anion exchange resin. The apparatus consists of a tubular glass container having the required number of layers of ion exchange material. Foraminous end plates permit the flow of water into the ion exchange bed and finally out of the device. (Sinha-OEIS)
W72-06630

FLUORIDE IN DRINKING WATER AND EXPERIMENTAL DENTAL CARIES IN RATS,
Aichi-Gakuin Univ. (Japan). School of Dentistry.
For primary bibliographic entry see Field 05B.
W72-06682

PREDATION OF SCHISTOSOMIASIS VECTOR SNAILS BY OSTRACODA (CRUSTACEA),
Geological Survey, Washington, D.C.
I. G. Sohn, and L. S. Kornicker.
Science, Vol 175, No 4027, p 1258-1259, March 17, 1972. 1 fig, 1 tab, 9 ref.

Descriptors: *Biocontrol, *Aquatic animals, *Diseases, *Epizoology, Snails, Environmental sanitation, Water pollution, Laboratory tests, Trematodes.
Identifiers: *Schistosomiasis, Blood fluke, Ostracoda.

Results are described of experiments performed in the field of biological control of trematode diseases, particularly the efficacy of ostracods as a control. Schistosomiasis is a disease in tropical and subtropical areas that is caused by several species of human flukes which require certain species of snails as intermediate hosts. Laboratory studies indicate that an ostracod species of Cypretta is an effective predator on 1-to 3-day-old Biomphalaria glabrata, a vector snail of the blood fluke that causes schistosomiasis. Field tests are necessary to bear out the laboratory findings. (Lang-USGS)
W72-06765

POTATO STARCH AS A SLUDGE CONDITIONER,
Gainesville Water and Sewage Dept., Fla.
For primary bibliographic entry see Field 05D.
W72-06819

RECLAIMING WATER FROM WATER PLANT SLUDGE,
Lompoc Water Utility, Calif.
For primary bibliographic entry see Field 05D.
W72-06822

WATER UTILITIES -- A VICTIM OF SUCCESS,
Washington State Dept. of Social and Health Services, Olympia.
J. C. Pluntze.
Journal of the American Water Works Association, Vol. 63, No. 11, p 551-554, September 1971. 1 fig, 4 ref.

Descriptors: *Utilities, *Water supply, *Water quality, *Washington, *Standards, Water storage, Distribution systems, Bacteria, Control, Facilities, Planning, Operation and maintenance, Measurement, Evaluation.
Identifiers: *Surveillance, *Waterborne disease.

The US Public Health Service (USPHS) Community Water Supply Study discovered that one out of six water supplies failed to meet one of the mandatory drinking-water standards; one out of four failed to meet one of the recommended standards; more than half were judged to have major deficiencies of supply, storage, or distribution; 90 per cent failed to meet the bacteriological standards; and 90 per cent had no cross-connection control programs. Such conditions exist in the State of Washington, which is the focus of this article. Such problems are particularly acute in Washington because of a greater percentage of smaller water systems, where the worst problems are most frequently located. The status of the larger water system is discussed in terms of facilities, water quality, planning, operation, and surveillance. The problem of substandard water quality is the result of the widely held belief that the decline of waterborne disease in the US means that the battle is won. The incidence of disease is no longer an acceptable measure of the adequacy of a public water supply. Apathy and the lack of funds have also contributed to the existence of water supply problems. Suggestions relating to the situation in Washington are made. Automatic controls and recording equipment should be extended to smaller systems. Additional bacteriological samples are needed from many of the smaller systems. Each water purveyor should make a close examination of the American Water Works Association quality goals and formulate a plan for meeting them. All water-works operators should be certified. Water rates should be reviewed periodically. (Strachan-Chicago)
W72-06945

EXPERIMENTAL DENTAL CARIES IN RATS BY SODIUM FLUORIDE AND MOLYBDENUM IN THE DRINKING WATER,
Aichi-Gakuin Univ. (Japan). School of Dentistry.
For primary bibliographic entry see Field 05B.
W72-06948

VELOCITY-GRADIENT PATHS IN COAGULATION,
Montgomery (James M.) Consulting Engineers, Inc., Pasadena, Calif.
R. K. Ham.
Journal of American Water Works Association, Vol. 63, No. 7, p 439-448, July 1971. 3 fig, 6 tab, 22 ref. OWRR A-028-WIS (3).

Descriptors: *Water treatment, *Mixing, *Coagulation, *Flocculation, *Sedimentation, Filtration.
Identifiers: Jar tests, Pilot plant, *Velocity-gradient path.

Rapid-mix and flocculation velocity-gradient paths were studied for their effect on alum coagulation of a silica suspension. The results were analyzed by evaluating the settled-turbidity reduction and time for visible floc formation in jar tests and effluent turbidity in continuous-flow pilot-plant experiments. For a constant value and for settling

periods commonly used (about 30 min.) the tapered-velocitygradient path resulted in the greatest turbidity removals. The initial or rapid-mix portion of the velocity-gradient path has a definite effect on the floc properties leaving the rapid mixer and also the detention time of the flocculation tank required to obtain a specific degree of supernatant clarity on settling. A design in which rapid mixing is continued until floc particles reach near equilibrium sizes, followed by a tapered flocculation velocity gradient path, is suggested for optimum sedimentation. If a coagulated suspension is not subjected to sedimentation, it is preferable to rapid-mix to equilibrium particle size and then filter, leaving out the relatively low velocity-gradient period of flocculation. (Bean-AWWARF)
W72-06973

EMERGENCY WATER SUPPLY FACILITIES FOR THE SCHUYLKILL COUNTY MUNICIPAL AUTHORITY,
Chester Engineers, Pittsburgh, Pa.
A. E. Bailey.
Journal of the Pennsylvania Water Works Operators' Association, Vol. 38, p 41-47, 1966.

Descriptors: *Water treatment, *Droughts, Iron, Manganese, Water supply, Potable water, Acid mine water, Mine wastes, Waste water treatment.
Identifiers: *Treatment lagoons, *Strip mine pits.

When the drought of 1962, 1963 and 1964 reduced reservoir storage to 65 per cent, as of June 12, 1965, the Schuylkill County Municipal Authority directed studies to develop an emergency source of supply. Wells in the area had poor yield, streams were badly contaminated, and the only other sources were two abandoned strip mine pits. One of these contained water with over 1,000 ppm hardness, the sulfate content ranged between 700 and 2,000 ppm, and it had a high iron and manganese content. The other (Morea strip pit) located on the Mill Creek watershed; contained several billion gallons, the sulfate content ranged between 200 and 250 ppm, iron and manganese 3 to 5 ppm, and pH 2.5 to 4.0. A treatment lagoon was constructed adjacent to Mill Creek below the Morea strip pit; it was 100 ft wide, 200 ft long, and 6 ft deep, its capacity was 900,000 gallons, providing 5 hours detention at 4.3 mgd. No electric power was available; lime was introduced manually (requiring a two man shift, three shifts per day) into the diversion flume from Creek to lagoon. An enclosed truck was used for lime storage. A 50 ft wooden overflow weir was constructed at the outlet end; the overflow went into a pump suction well. Two gasoline driven centrifuge pumps were obtained from the office of Civil Defense; each had a capacity of 1,500 gpm. They pumped through 8 in steel pipe lines into the Eisenhuth reservoir (175 mg capacity) therein mixing with the regular supply. When gravity flow from the strip pit to the Creek stopped, two pumps were used to lift water from the pit. In about 4 1/2 months 496 mg was processed before icing forced shut down of the operations. (Bean-AWWARF)
W72-06978

IRON AND MANGANESE REMOVAL AT WEST VIEW, PA.,
West View Borough Municipal Authority, Pa.
H. Shea.
Journal of the Pennsylvania Water Works Operators' Association, Vol. 33, p 23-30, 1961.

Descriptors: *Water treatment, Water supply, *Filtration, *Softening, *Resins, *Iron, *Manganese, Potassium compounds, Treatment facilities.
Identifiers: *Anthracite filter, *Greensand, *Ferrosand, Permanganate.

From raw water with a high of 6 ppm iron and manganese, an effluent was produced with 0.05 ppm iron and 0.05 ppm manganese and 80-90 ppm hardness. (Raw water reaches 275 ppm hardness at times). Effluent from a gravity filter of 10 in. anthracite on 20 in. Ferrosand, with a Carox prefeed is consistently lower than 0.1 ppm of iron and manganese. Synthetic resin, used for softening, is regenerated by 8 percent salt brine pumped from 1270 ft deep wells on the plant property. The brine is aerated, treated with sodium sulfate to remove barium, and with lime for iron and manganese removal, settled and pressure filtered. Then it is pumped to the wash water tank. When loss of exchange capacity occurred because of iron and manganese fouling, the resin was cleaned with 2 pounds sodium hydrosulfite per cu ft of resin. Iron and manganese are removed by the resins, operating at 5 gpm/sq ft, but when the hardness of effluent reaches about 45 ppm they pass the filter. One new gravel-packed well produces water very low in iron and manganese. (Bean-AWWARF)
W72-07095

POTENT PURPLE POTASSIUM PERMANGANATE,
Carus Chemical Co., LaSalle, Ill.
W. A. Welch.
Journal of the Pennsylvania Water Works Operators' Association, Vol. 38, p 15-23, 1966.

Descriptors: *Water treatment, *Iron, *Manganese, *Taste, *Odor, *Filtration, *Oxidation, *Organic matter, *Potassium compounds, Flocculation.
Identifiers: *Permanganate.

The application of 'Cairox' before chlorine is suggested to prevent chlorinous or chlorophenal tastes; also application before alum or with the alum to improve flocculation. The use of permanganate is summarized as follows: (1) Determine the demand of the raw water either by means of jar tests or experimental plant application. (2) The feeder setting at the proper dose on a plant scale will depend upon the permanganate demand as well as the rate of pumpage. (3) If a persistent pink for 30 minutes does not remove odor, it may be advisable to increase the Cairox dose in order to carry the pink color about two-thirds of the way through the final settling basin. This point should not be overlooked especially in cold weather when the oxidation of organic material proceeds more slowly. (4) Do not worry if the pink color should accidently go to the filters, because there is enough organic material in most filters to consume a moderate excess of permanganate. (5) After Cairox is used for a long time, the sand will become coated with manganese dioxide hydrate, which acts as an excellent buffer, not only for removing pink color, but also for removing iron and manganese in case sufficient Cairox has not been applied in pre-treatment. (6) The average dose of Cairox is between 1 and 2 ppm. (7) The point of application should be as far ahead of chlorine and alum as possible. (Bean-AWWARF)
W72-07096

AGRICULTURAL INSECTICIDES AS A POTENTIAL WATER POLLUTANT,
West Virginia Pulp and Paper Co., New York.
E. A. Sigworth.
Journal of the Pennsylvania Water Works Operators' Association, Vol. 33, p 44-48, 3 tab, 5 ref, 1961.

Descriptors: *Water pollution sources, *Water pollution treatment, *Water treatment, Water quality, *Insecticides, Toxicity, Odor, Activated carbon, *Farm wastes.

Since so much of our land area is wooded or farmland, the farmer has the advantage of first use of most virgin waters. What he does with this water in growing crops, watering livestock, and disposal of barnyard and household wastes can appreciably alter water quality. For instance, phosphate wash from farm crops caused severe algal problems. Of 185 instances of fish kills in 1960, 40 percent were attributed to agricultural chemicals. Although a few were due to aerial dusting, probably the majority were due to accident spills into the streams, or cleaning spray tanks and discharging the cleaning liquid into streams. Tables show the toxicity of insecticides to fish and to rats, also the minimum concentrations in water which can be detected by odor. Although concentrations of insecticides may reach water supplies in sufficient quantity to cause fish kills, it would seem doubtful that they would reach sufficient concentrations to be toxic to humans. Odors of the various insecticides are sufficiently different from normal odors in water supplies to give tentative identification of at least some of the insecticides, particularly if such odors are associated with fish kills in the water supply. In the event of contamination of water supplies by insecticides, activated carbon appears to be the only treatment which can be expected to accomplish purification of the supply. (Bean-AWWARF)
W72-07097

METAPHOSPHATE PROTECTION AFTER PIPE-LINE CLEANING,
Portland Water District, Maine.
W. D. Monie.
Journal of the Pennsylvania Water Works Operators' Association, Vol. 33, p 57-71, 5 fig, 3 tab, 1961.

Descriptors: *Corrosion control, *Water treatment, Water quality, *Corrosion, Water distribution (Applied), *Phosphates, Costs, *Pipes, *Pipelines, Cleaning.
Identifiers: *Pipe cleaning.

A six year study at Portland, Maine of the effects of metaphosphate is described. By pipe cleaning, the pipeline coefficient was raised from 56 to above 110. By chemical treatment with sodium hexametaphosphate, a high coefficient was maintained with slight loss over a six year period. No red-water complaints were received at any time after pipe cleaning. The cost of chemical treatment, as compared to the carrying charges on the cost of either water-main replacement or reinforcement, was small. The labor cost of chemical treatment is minor; a man must check the pumping station each day, and only a few minutes of his time are needed to prepare the chemical. (Bean-AWWARF)
W72-07098

5G. Water Quality Control

POPULATION ABSORPTION AND REGIONAL WATER MANAGEMENT,
For primary bibliographic entry see Field 06B.
W72-06583

UNIT AND TOTAL COST FUNCTIONS FOR WATER TREATMENT BASED ON KOENIG'S DATA,
Illinois Univ., Urbana. Dept. of Business Administration.
For primary bibliographic entry see Field 06C.
W72-06584

A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS, REPORT OF WATER QUALITY SUBPROJECT,
Idaho Univ., Moscow. Water Resources Research Inst.
Fred J. Watts.
Available from the National Technical Information Service as PB-208 028, $3.00 in paper copy, $0.95 in microfiche. Partial Completion Report, November 1971, 60 p, 27 fig, 1 tab, 21 ref, append. OWRR B-014-IDA (12).

Descriptors: *Water quality standards, *Standards, *Regulation, *River basins, *River regulation, *River systems, Water quality control, River basin development, Watershed management, Sedimentation, Lumbering.

Identifiers: *Salmon River basin.

The Salmon River in its present condition is a high quality river. With adequate sewage treatment at the community of Salmon, the coliform levels should become quite acceptable in the entire stretch of the river. Idaho water quality rules and regulations are sufficient to maintain water quality adequate for any of three designated classes of river if enforced. For this reason a 'System river' designation is of little consequence economically as far as water quality is concerned, i.e. state regulations will control, and as long as these standards are met, the water will be of adequate quality for any of the three types of system rivers. The major problem that remains is the establishment of 'background levels' of the various pollutants which the state laws refer to but do not quantify. Reasonable limits will have to be determined based on a rather thorough monitoring system. If the state water quality requirements are to be met and if the main stem of the Salmon is to be designated a system river, then a management plan for the drainage area and river will have to be developed to ensure that water quality will remain at least at the present level. In particular, logging areas will have to be developed in such a way that no appreciable increase in sedimentation above normal background levels will occur. This will probably be a difficult criteria to develop and enforce.
W72-06610

SURVEY OF ALTERNATE METHODS FOR COOLING CONDENSER DISCHARGE WATER--OPERATING CHARACTERISTICS AND DESIGN CRITERIA.
Dynatech Corp., Cambridge, Mass.
For primary bibliographic entry see Field 05D.
W72-06616

A SURVEY OF ALTERNATE METHODS FOR COOLING CONDENSER DISCHARGE WATER--LARGE-SCALE HEAT REJECTION EQUIPMENT.
Dynatech Corp., Cambridge, Mass.
For primary bibliographic entry see Field 05D.
W72-06617

EFFECT OF GEOGRAPHICAL LOCATION ON COOLING POND REQUIREMENTS AND PERFORMANCE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
E. L. Thackston, and F. L. Parker.
Available from the National Technical Information Service as PB-208 031, $0.95 in microfiche. Environmental Protection Agency-Water Quality Office, Water Pollution Control Research Series, March 1971, 234 p, 125 fig, 92 tab, 13 ref, 2 append. EPA Program 16130 FDQ 03/71.

Descriptors: *Ponds, *Cooling, *Heat transfer, *Thermal pollution, Water temperature, Thermal powerplants, Mathematical models, Geographical regions, Energy budget, *Weather data.
Identifiers: *Cooling ponds, *Heat transfer coefficient, Equilibrium temperature, Geographic variation.

The energy budget approach to cooling ponds has been outlined and applied to cooling ponds. Monthly average weather data from 88 stations throughout the U.S. were used to calculate equilibrium temperatures, heat exchange coefficients, and amount of cooling in various sized ponds receiving the effluent from a standard power plant of 1000-mw capacity, both for average and extreme weather conditions. The data for each station are shown on a chart, and the variation of these results across the U.S. is depicted by a series of 28 maps of the U.S. with contours connecting equal values of the parameters. The results may also be used to estimate cooling pond performance for other sized power plants. The maps disclose variations across the U.S., on a given date, of up to 55 degrees F in equilibrium temperature, up to 100% difference in heat exchange coefficients, up to 50% difference in heat lost from a given sized pond, and up to 200% difference in the size of a pond necessary to produce an equal cooling effect. (EPA)
W72-06618

BOOM FOR SCREENING IN AND COLLECTING UP OF POLLUTION ON WATER,
Trygve Mikkelsen.
U. S. Patent No. 3,499,291, 4 p, 4 fig, 5 ref; Patent Abstracts Section, Official Gazette, Vol. 872, No. 2, p 391, March 10, 1970.

Descriptors: *Patents, *Oil wastes, Oily water, Water pollution control, Separation techniques, Sea water, *Pollution abatement, Mechanical equipment.
Identifiers: *Boom construction, Screening.

The boom consists of floatable and foldable flat sections linked together as a zig-zag rail. It has one or more purse lines arranged to fold the flat sections on being drawn in. The boom acts as an upstanding barrier above the water surface. The individual plates are made of porous plastic and are covered and linked by a pliable material which is durable in sea water and oil. (Sinha-OEIS)
W72-06622

AEROBIC WASTE SYSTEM WITH PNEUMATIC EJECTION AND CHLORINATION,
Water Pollution Controls, Inc. (Assignee).
For primary bibliographic entry see Field 05D.
W72-06627

BLENDED GRANULAR BEDS FOR WATER AND WASTEWATER FILTERS,
For primary bibliographic entry see Field 05D.
W72-06629

WATER POLLUTION CONTROL LEGISLATION, AGRICULTURAL RUNOFF, PART 6.
Congress, Washington, D.C.

Hearings before the Committee on Public Works, Subcommittee on Air and Water Pollution, 92d Cong, 1st Sess. April 2, 1971. p 2515-3188, 64 fig, 208 tab, 9 chart, 420 ref.

Descriptors: *Agricultural chemicals, *Chemical wastes, *Farm wastes, *Livestock, *Water pollution sources, Missouri, Kansas, Runoff, Fertilizers, Pesticides, Waste disposal, Nitrates, Leaching, Salts, Associated costs, Eutrophication, Legal aspects, Social aspects, Nutrients, Bodies of water, Legislation, Federal government.
Identifiers: *Agricultural runoff.

Testimony was heard by the Senate Subcommittee on Air and Water Pollution, as part of its investigation into the effects of agricultural waste runoff on water. Agricultural operations in Kansas and Missouri are examined. Agricultural water pollution results primarily from surface runoff of silt, animal wastes, pesticides, fertilizers, and other chemical and biological agents. The problem of concentrated animal wastes from large-scale feedlots is explored. Current methods of controlling agricultural pollution, changes needed to correct current problems, and cost impacts are covered from the viewpoint of industry, science, and elected public officials. An extensive appendix includes articles and scientific papers relating to water pollution from agricultural runoff. Methods of curtailing and preventing the discharge of concentrated organic wastes into rivers and streams are explained. The contamination of surface water from plowing under concentrated feedlot manure is discussed. The contamination of water supplies by inorganic fertilizer salts is also examined. (Grant-Florida)
W72-06633

WATER POLLUTION CONTROL LEGISLATION, OCEAN DUMPING, PART 5.
Congress, Washington, D.C.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $2.75. Hearings before Committee on Public Works, Subcommittee on Air and Water Pollution. 92d Cong, 1st Sess, March 26, June 16, 1971. p 1909-2514, 60 fig, 2 map, 3 photo, 52 tab, 1 chart, 155 ref.

Descriptors: *Water pollution control, *Water pollution sources, *Water pollution effects, *Oceans, *Coasts, Pollutant identification, Aquatic environment, Legislation, Commercial fishing, Sewage disposal, Industrial wastes, Municipal wastes, Federal jurisdiction, State jurisdiction, Solid wastes, Marine animals, Public health, Shellfish, Clams, Oxygen requirements, Continental shelf, Pollution abatement, Federal government, United States.

The effects of ocean waste disposal and, more specifically, the coastal pollution experiences of New York, New Jersey, and Delaware are discussed. Numerous reports and studies are included, and the testimony of experts, including a report to the President on ocean dumping by the Council on Environmental Quality, is presented. Inventories of ocean dumped wastes, the effects of these wastes on the marine environment and man, and alternatives to ocean dumping of wastes are set forth. Testimony is presented on the chemical effects of ocean dumping and the damage done to commercial fishing. The views of a variety of other interested individuals and organizations, ranging from the Sierra Club to a barge hauling firm, are set forth. The text of a Senate bill to regulate ocean dumping, entitled the Marine Protection Act of 1971, is included. (Brackins-Florida)
W72-06634

THE WATER RIGHTS AND WATER POLLUTION LAW OF MISSISSIPPI.
Mississippi Agricultural and Forestry Experimentation Station, State College.

Legal Institute for Agriculture and Resource Development, Publication No. 1. 27 p, 2 ref.

Descriptors: *Mississippi, *Appropriation, *Riparian rights, *Water pollution control, Reasonable use, Beneficial use, Preferences (Water rights), Domestic water, Water pollution, Water pollution sources, Groundwater, Percolating water, Legislation, Regulation, United States, Legal aspects, Judicial decisions, Riparian land, Natural flow doctrine, Water rights.

Mississippi water law is a dual system consisting of remnants of the riparian doctrine and an appropriation act that has not been interpreted by the courts. To have a valid right to use water, a person must acquire a permit from the State Board of Water Commissioners. The statute specifically excludes all groundwater. Water appropriation rights are restricted to beneficial uses. Courts have adopted the strict common law rule of capture with regard to percolating groundwater. Such water belongs to the realty and may be used at will by the owner for any purpose. Recent legislation created a State Air and Water Pollution Control Commission with broad authority to control pollution of surface and underground waters. The public has virtually unlimited use of the surface of state waters. Before the public can exercise its rights, however, it must gain lawful access to the water. The lack of statutory control over groundwater, and the failure of the Appropriation Act to provide for preferences, other than for domestic use, are criticized. Federal statutory and constitutional water rights are discussed. (Smiljanich-Florida)
W72-06636

HISTORICAL, LEGAL AND INSTITUTIONAL ENVIRONMENT OF WATER AND RELATED LAND RESOURCES IN RHODE ISLAND, SECTION A--STATE LAWS.
Rhode Island Water Resources Board, Providence.
For primary bibliographic entry see Field 06E.
W72-06637

PHOSPHATES IN DETERGENTS: THE CHICAGO-TYPE ORDINANCE AND OTHER REMEDIES,
B. Niehoff.
Cincinnati Law Review, Vol. 40, No. 3, p 548-568, 1971. 115 ref.

Descriptors: *Eutrophication, *Detergents, *Phosphates, *Local governments, *Water pollution control, Water quality control, Phosphorus, Aquatic environment, Water pollution effects, Algae, Nutrients, Water pollution sources, Sewage treatment, Public health, Waste water treatment, Research and development, Municipal wastes, Legislation, Regulation, Phosphorus compounds, Federal government.

Phosphate detergents are a major cause of accelerated eutrophication. This process fouls lakes and rivers with mats of algae and weeds. A number of local governments have enacted Chicago-type ordinances to control the use of phosphate detergents. Under the Chicago ordinance it is illegal to sell detergents containing phosphates. The Chicago ordinance allows some exemptions for machines built to use only phosphate detergents, and for health and sanitation reasons. Many ordinances have labeling requirements. A Federal Trade Commission proposal would go further and require a warning on the container. This proposal may, however, be confusing and raise unnecessary consumer doubts. The detergent industry insists local ordinances are an unconstitutional restraint of interstate commerce. However, they are probably a constitutional exercise of local police powers. At least four phosphate-detergent control laws are now before Congress. The soundest of these prohibits the manufacturing or importation of any detergent containing phosphate after June 30, 1973. (Brackins-Florida)
W72-06638

THEORIES OF WATER POLLUTION LITIGATION,
Missouri Univ., Columbia. Coll. of Law.
P. N. Davis.
Wisconsin Law Review, 1971. No. 3, p 738-816, 6 tab, 189 ref, 6 append.

Descriptors: *Judicial decisions, *Riparian rights, *Pollution abatement, Water pollution, Legal aspects, Natural flow doctrine, Prescriptive rights, Competing uses, Riparian land, Waste disposal, Reasonable use, Industrial water, Rivers, Administrative agencies, State governments, Adjudiciation procedure.
Identifiers: *Nuisance (Legal aspects), *Common law, Injunctions (Prohibitory).

Water pollution cases contain a fundamental source of confusion: which legal theory is to be followed--natural flow, reasonable use, or private nuisance. American courts have shown little understanding of the doctrinal differences among these disparate concepts. These doctrines, the extent of their actual use, and interpretations of various cases are examined. Nuisance theory has been used primarily in dealing with interference to domestic water supplies, odors, and injuries to land. Riparian rights doctrine has been applied to all other water use situations, such as channel sedimentation, pollution of industrial water supplies, and deterioration of fishing. The right to discharge wastes is analyzed in terms of nuisance and riparian rights. Prescriptive rights apply only between riparians and may be overridden by state police power. The comparative convenience doctrine is used to find discharges reasonable. The creation of administrative agencies has influenced the use of common law doctrines, and the private litigant's role, which has declined due to acquiesence, may revive with the redefinition of 'reasonable' pollution. Appendixes cite numerous cases and code each citation in terms of a fact situation and the decision reached. Statistical summaries of decisions are provided. (Grant-Florida)
W72-06640

REFUSE ACT SUIT BROUGHT AGAINST PAPER COMPANY.
For primary bibliographic entry see Field 06E.
W72-06641

MUD GULCH FLOOD PREVENTION PROJECT MEASURE, SANGRE DE CRISTO RC AND D PROJECT, COLORADO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-06642

NATIONAL ENVIRONMENTAL CENTER ACT OF 1971,
Congress, Washington, D.C.; and Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-06652

CORPS OF ENGINEERS CAUGHT UP IN BATTLE OF THE BUILDERS AGAINST THE PRESERVERS,
For primary bibliographic entry see Field 06E.
W72-06653

STATEMENTS ON INTRODUCED BILLS AND JOINT RESOLUTIONS--RIVER BASIN WASTE TREATMENT AUTHORITY ACT OF 1971,
Congress, Washington, D.C.; and Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-06654

LEGISLATIVE RESPONSE TO 'SOFT SOAP' ON DETERGENTS,
Congress, Washington, D.C.; and Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-06655

WATER BANK ACT (A BILL TO PROVIDE FOR CONSERVING SURFACE WATERS, TO CONTRIBUTE TO IMPROVED WATER QUALITY AND REDUCE STREAM SEDIMENTATION, AND FOR OTHER PURPOSES).
For primary bibliographic entry see Field 06E.
W72-06656

INDUSTRIAL POLLUTION ABATEMENT AND PREVENTION ACT OF 1967 (A BILL TO PROVIDE A PROGRAM OF ECONOMIC INCENTIVES TO ASSIST AND ENCOURAGE INDUSTRY TO ASSUME ITS RESPONSIBILITY FOR ABATING AND PREVENTING THE POLLUTION OF WATER BY WASTES FROM INDUSTRIAL SOURCES).
For primary bibliographic entry see Field 06E.
W72-06657

PRICE INTRODUCES WATER QUALITY BILL,
Congress, Washington, D.C.; and House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-06658

ENVIRONMENTAL PROTECTION: WATER.
National Academy of Engineering, Washington, D.C. Committee on Power Plant Siting.
For primary bibliographic entry see Field 06G.
W72-06693

DETERMINATION OF THE BIODEGRADABILITY OF ANIONIC SYNTHETIC SURFACE AGENTS.
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 05A.
W72-06722

PESTICIDES IN WATER: RESIDUES IN PONDS TREATED WITH TWO FORMULATIONS OF DICHLOBENIL,
Agricultural Research Service, Prosser, Wash. Irrigated Agriculture Research and Extension Center.
For primary bibliographic entry see Field 05B.
W72-06773

PHOSPHATES AND THE CANADA WATER ACT,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 05B.
W72-06777

MERCURY--AN OVERVIEW,
New York State Coll. of Agriculture, Ithaca.
For primary bibliographic entry see Field 05B.
W72-06787

GASOLINE IN GROUNDWATER,
California Inst. of Tech., Pasadena. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05B.
W72-06810

VARIATIONS IN THE THERMIC AND OXYGEN REGIME OF LAKE SEVAN AND THEIR EFFECT ON SOME BIOLOGICAL PROCESSES,
For primary bibliographic entry see Field 05C.
W72-06818

ECOLOGY AND LAND USE OF THE SUPPLY PONDS NATURAL AREA, BRANFORD, CONNECTICUT,
For primary bibliographic entry see Field 06G.
W72-06824

EFFECTS OF DETERGENTS ON WATER SUPPLIES,
Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 05C.
W72-06837

POLLUTION ABATEMENT AND BY-PRODUCT RECOVERY IN SHELLFISH AND FISHERIES PROCESSING.
CRESA, Seattle, Wash.

Copy available from GPO Sup Doc, $1.00; microfiche from NTIS as PB-208 214, $0.95. Environmental Protection Agency Water Pollution Control Research Series, June 1971. 85 p, 12 fig, 13 tab, 16 ref. EPA Program 12130 FJQ--06/71.

Descriptors: *Commercial fishing, *Shellfish, *Byproducts, *Pollution abatement, Water pollution control, Separation techniques, Protein, Technical feasibility, Economic feasibility, Construction costs, Operation and maintenance, Cost analysis, Industrial wastes, Alaska.
Identifiers: *Chitin, *Byproduct recovery.

70 MILLION POUNDS OF SEAFOOD WASTES, MAINLY FROM CRAB, SALMON, AND SHRIMP FISHING, CONTAINING 22.1 MILLION POUNDS OF COD were discharged to Kodiak Harbor in 1970. A private firm was engaged to develop a plan to permit development of beneficial uses for the wastes while concurrently

reducing the pollutional load on the harbor. The plan which was developed included collection and transportation of the waste to a central processing site on Near Island for by-product recovery. Shellfish wastes would be extracted with dilute alkali to yield a high quality protein and a chitin-calcium carbonate residue, the former to be used as pet food additives or for industrial applications, and the latter to be exported for conversion to chitin and derived products or used in Alaska as a soil liming and fertilizer material. Fish wastes would also be extracted to yield a concentrated protein product similar to fish solubles oil and bone meal. Market surveys indicated that sufficient markets for the by-products existed to allow the system to pay for itself, with all charges to the industry being saved for rebuilding the plant in 7 years. The proposed plan would accomplish a 70% reduction in the present pollutional load and provide valuable by-products as well. (Lowry-Texas)
W72-06847

FERTILIZERS AND AGRICULTURAL CHEMICALS.
National Industrial Pollution Control Council, Washington, D.C. Fertilizer and Agricultural Chemicals Sub-Council.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.30. Report, October 1971. 40 p, 1 fig, 3 tab.

Descriptors: *Agricultural chemicals, *Food chains, *Productivity, *Population, Fertilizers, Pesticides, Herbicides, Fungicides, Insecticides, Selectivity, Leaching, Run-off, Crop production, Nitrogen, Eutrophication, Air pollution, Water pollution sources, Cost analysis, Legislation, Water quality control.
Identifiers: *Biological magnification.

A thorough analysis of the fertilizer and agricultural chemical industry has revealed several important factors: (1) it is now impossible to regress back to the 'good old days' of clean water and pure air by eliminating fertilizers and chemicals, since disease or starvation would be the inevitable results; (2) no concrete evidence has yet been introduced which demonstrates that nutrient run-off from a well managed crop field is greater than that from the original trees or grasslands; and (3) control of the adverse environmental effects of fertilizer and of the adverse environmental effects of fertilizer and chemical manufacture and use can be achieved only by co-operative efforts between the regulatory agencies and the agricultural chemicals industry. Standards which are imposed must recognize the current state of technology and the financial position of the industry and become more stringent as technology advances and the financial picture improves. Although environmental protection is highly desirable, the food requirements of an ever growing world population must also be considered. (Lowry-Texas)
W72-06860

THE USE OF POLAROGRAPHY IN WATER POLLUTION CONTROL,
Cambridge Water Works (England).
B. R. Johnson.
Water Pollution Control, Vol 70, No. 6, 1971, p 619-625, 3 fig, 6 tab, 10 ref.

Descriptors: *Polarographic analysis, *Instrumentation, *Water analysis, Sampling, Heavy metals, Trace elements, Nitrates, Laboratory tests, Evaporation, Distillation, Temperature, Analytical techniques, Water pollution control, *Anions, Cations.

The polarograph, introduced in 1922, has evolved into a rapid and accurate tool for the determination of cations and anions of interest in the field of water pollution control. Examples of preparation and techniques for determing copper, cadmium, nickel, zinc, lead, chromium, nitrogen, and dissolved oxygen levels are presented. Results of polarography are compared with results obtained using the phenol disulphonic acid method for nitrate determinations, with the polarographic method shown to be more accurate within the range tested. Minimum cell concentrations necessary for results of greater than 90% were 0.5, 0.2, 0.2, 0.2, 0.5, 0.5 and 0.2 mg/l for copper, cadmium, nickel, zinc, lead, chromium and nitrate respectively. Ohter advantages of polarography include (1) speed and accuracy in performing simultaneous determinations of different elements in the same solution; (2) extreme versatility for many constituents without the need for extensive pre-treatment of samples; (3) interpretation of steps is essentially simple although requiring both care and experience; and (4) useful results can be obtained using a relatively cheap and simple instrument capable of high volume output with excellent reproducibility. (Lowry-Texas)
W72-06867

THE ROLE OF THE ENVIRONMENTAL PROTECTION AGENCY,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-06871

ENVIRONMENTAL LITIGATION: STRENGTHS AND WEAKNESSES,
American Native Rights Fund, Boulder, Colo.
For primary bibliographic entry see Field 06G.
W72-06872

EFFLUENT FEES IN WATER QUALITY MANAGEMENT: THE VERMONT WATER POLLUTION CONTROL ACT,
N. P. Moros.
Environmental Affairs, Vol. 1, No. 3, p. 631-653, November 1971. 60 ref.

Descriptors: *Vermont, *Water pollution control, *Treatment facilities, *Water quality control, *Permits, *Industrial wastes, Effluents, Costs, Regulation, Non-structural alternatives, Water resources development, Water pollution sources, Sanitary engineering, Legal aspects, Water law, Administration, Administrative agencies, State governments, Economics, Legislation, Standards.
Identifiers: *Effluent charges.

Vermont recently enacted a Water Pollution Control Act which combines a discharge permit system and an effluent fee system. The legislation is unique and probably one of the most effective anti-pollution measures yet introduced. A permit will not be issued if a discharge reduces the quality of receiving waters. A discharger who can not obtain a permit may, however, be granted a temporary permit, if an effort is being made to install treatment facilities. A condition of a temporary permit is that the discharger pay periodic effluent fees in accordance with rates established by the Water Resources Board. The fee provides an economic incentive for polluters to reduce the volume and noxiousness of discharges. The two most significant approaches for determing the fee to be imposed, the cost-of-treatment method and the downstream-damages method, are examined in view of such factors as constitutionality, equity, and administrative feasibility; the cost-of-treatment method is the most desirable method. A specific plan for implementing this approach is suggested. (Johnson-Florida)
W72-06873

CONSTITUTIONAL IMPLICATIONS OF WETLANDS LEGISLATION,
For primary bibliographic entry see Field 06E.
W72-06874

FEDERAL COURTS--JURISDICTION--A COMPARISON OF TEXAS V. PANKEY AND OHIO V. WYANDOTTE CHEMICAL CORP. REVEALS THE NECESSITY FOR A FEDERAL COMMON LAW RIGHT TO ABATE INTERSTATE POLLUTION.

Texas Law Review, Vol 50, p. 183-198, December 1971. 69 ref.

Descriptors: *Federal jurisdiction, *State jurisdiction, *Judicial decisions, *Pollution abatement, *Adjudication procedure, Interstate, Legal aspects, Water law, Public rights, Administration, Administrative agencies, Boundaries (Property), Federal government, Jurisdiction, Legislation, Regulation, Third party effects, Political aspects, Water resources development, State governments, Water pollution, Water pollution sources, Water pollution effects.

Water pollution's disrespect for state boundaries engenders fundamental jurisdictional problems in pollution abatement suits brought by states, where the pollution originates from an out of state source. In using state courts, a plaintiff state encounters problems in getting jurisdiction over the source of pollution and enforcing decisions. While these problems would be greatly simplified by using federal courts, it is uncertain whether states can use the federal courts for abating interstate pollution. Two recent cases indicated conflicting answers. The Pankey case held that a federal district court had federal question jurisdiction based on the federal common law right of a state to protect its environment from pollution arising in other states. The Wyandotte case included dicta that no such jurisdiction existed. The federal common law right and federal district court jurisdiction should be recognized. This would solve problems incurred in using state courts and also provide a uniform law for dealing with interstate pollution. Extension of such rights to private litigants would be beneficial, because private litigants would thereby not be forced to choose between pollution control policies of respective states. (Johnson-Florida)
W72-06876

INTERNATIONAL PROBLEMS CONCERNING POLLUTION AND THE ENVIRONMENT,
For primary bibliographic entry see Field 06E.
W72-06877

LEGAL ASPECTS OF SEABED PETROLEUM AND MINERAL RESOURCE DEVELOPMENT--THE DRAFT UNITED NATIONS CONVENTION ON THE INTERNATIONAL SEABED AREA AND THE UNITED STATES WORKING PAPER SUBMITTED TO THE UNITED NATIONS SEABED COMMITTEE.
For primary bibliographic entry see Field 06E.
W72-06878

QUI TAM ACTIONS FOR CITIZEN ENFORCEMENT OF THE REFUSE ACT OF 1899 AGAINST POLLUTERS,
Cleveland State Univ., Ohio. Coll. of Law.
J. S. Ott.
Cleveland State Law Review, Vol. 21, p. 182-189, January 1972. 43 ref.

Descriptors: *Rivers and Harbors Act, *Remedies, *Pollution abatement, *Adjudication procedure, *Publil rights, Legal aspects, Legislation, Pollutants, Water law, Water resources, Administrative costs, judicial decisions, Federal government.
Identifiers: *Refuse Act, *Qui tam action.

The possibility that private citizens may enforce the Refuse Act when public prosecutors refuse to act, is evaluated in the note. Enforcement could be obtained through application of the qui tam theory to the criminal sanctions of the Refuse Act. Section 407 of the Act defines pollution as an unlawful act; section 411 establishes a penalty and provides that one-half of the fine be paid to the informer.

With these elements, some argue that an informer may bring the action himself. The rationale favoring qui tam actions is based on the limited funds of the Justice Department. Judicial response to qui tam actions under the Refuse Act has been wholly negative: the four such actions reported since 1970 have all been dismissed. These decisions have applied sound legal reasoning in rejecting qui tam actions. Since criminal statutes cannot be enforced by civil actions, private parties have no right to enforce sanctions of the Refuse Act. It would be folly for the judicial system to support weak legal authority advanced in favor of qui tam actions. (Doise-Florida)
W72-06879

LONGVIEW LAKE, LITTLE BLUE RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer, District, Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W72-06881

DANBURY LOCAL PROTECTION PROJECT, STILL RIVER, DANBURY, CONNECTICUT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 08A.
W72-06882

DISPOSAL SYSTEMS AND HEARINGS (RELATING TO WATER POLLUTION CONTROL).
South Carolina Pollution Control Authority, Columbia.

Rules and Regulations, PC-W-Regulation 1, Pursuant to sections 70-101 thru 70-139, South Carolina Code of Laws. 2 p.

Descriptors: *South Carolina, *Administrative agencies, *Adjudication procedure, *Administrative decisions, Water pollution control, Permits, Regulation, Legislation, Sewage disposal, Legal aspects, Public health, Cities, Public rights.

Procedures governing hearings of the South Carolina Pollution Control Authority are herein set forth. Applications for plans and permits for projects concerning disposal systems shall be submitted in accordance with existing regulations. Public notice of hearings relating to water pollution control must be published once a week for two consecutive weeks in a newspaper in the county wherein the waters concerned are located. Public hearings shall be conducted by hearing examiners who are members of the Authority or who are duly authorized by the Authority. All parties interested may file briefs and make oral arguments at the discretion of the hearing examiner. Hearing examiners shall report to the Authority within 60 days after the close of a hearing and the Authority has six months within which to make decisions. Appeals must be made within 30 days after a final order is entered. Persons desiring hearings by the Authority shall submit written requests designating questions to be considered. (Doise-Florida)
W72-06883

EFFLUENT TAXES AND REGULATION.
Resources, No. 39, p. 9-10, January 1972.

Descriptors: *Pollution taxes (Charges), *Cost repayment, *Water pollution control, *Pollution abatement, *Industrial wastes, Social aspects, Water pollution treatment, Water pollution sources, Prices, Economies of scale, River basin development, River basin commissions, Nonstructural alternatives, Legislation, Federal government, State governments, Taxes, Political aspects, Effluents.

Present governmental programs to combat environmental pollution depend heavily on enforcement action against individual polluters and subsidies for treatment plant construction. Many economists favor greater reliance on effluent charges. This would be more efficient and equitable because social costs would be reflected and costs would be internal to the polluter. This would create an incentive to reduce pollution by any means less expensive than the tax. It would also reduce consumptive demand through higher prices. Uniform regional rates would be needed. Integrated regional and river basin institutions are needed to reduce treatment costs through economies of scale. Several prominent conservation groups have recently announced their support for effluent charges because current abatement methods are ineffective. Some states have shown an interest, and some groups in the Nixon Administration view it favorably. Senator Proxmire has introduced a bill calling for a national effluent charge. Issues currently being discussed concern: (1) the determination of a proper basis for the charge, (2) the desirability of a national tax, and (3) the relationship to regional environmental enforcement schemes. (Grant-Florida)
W72-06884

CONSERVATIONISTS LOSE FLOOR BATTLE TO AMEND PL-566.
For primary bibliographic entry see Field 06E.
W72-06886

HOUSE WATER BILL DUE OUT MARCH 10.
For primary bibliographic entry see Field 06E.
W72-06887

PROBLEMS OF WATER POLLUTION,
Congress, Washington D.C.; and House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-06890

REQUIREMENT FOR SMALL BUSINESSES TO MAKE WATER POLLUTION IMPROVEMENTS,
Congress, Washington, D.C.; and Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-06891

ENVIRONMENTAL DEFENSE FUND, INC. V. CORPS OF ENGINEERS (STANDING OF ENVIRONMENTAL ORGANIZATION TO CONTEST DAM CONSTRUCTION).
For primary bibliographic entry see Field 06E.
W72-06897

COLLINS V. COSGROVE-MEEHAN COAL CO. (MINING COMPANY'S LIABILITY FOR FLOODING FARM WITH COAL MINE WASTES).
For primary bibliographic entry see Field 06E.
W72-06903

MEREDOSIA LAKE DRAINAGE AND LEVEE DIST. V. SANITARY DIST. OF CHICAGO (LIABILITY OF SANITARY DISTRICT FOR OVERFLOW OF RIVER LEVEES).
For primary bibliographic entry see Field 06E.
W72-06904

PRELIMINARY ANALYSIS OF THE ECOLOGICAL ASPECTS OF DEEP PORT CREATION AND SUPERSHIP OPERATION.
Institute for Water Resources (Army), Alexandria, Va.
For primary bibliographic entry see Field 08A.
W72-06923

HYDROLOGY, GLACIAL GEOLOGY AND ENVIRONMENTAL GEOLOGY OF THE WYOMING-LACKAWANNA VALLEY,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 05B.
W72-06928

ENVIRONMENTAL PLANNING AND MANAGEMENT,
Drexel Univ., Philadelphia, Pa.
For primary bibliographic entry see Field 06B.
W72-06938

WATER AND WASTE WATER,
Drexel Univ., Philadelphia, Pa.
For primary bibliographic entry see Field 05D.
W72-06939

ENVIRONMENT AND HEALTH,
Drexel Univ., Philadelphia, Pa.
P. W. Purdom.
In: Environmental Health, Academic Press, New York. 1971. p 1-25. 2 fig, 39 ref.

Descriptors: *Environment, *Quality control, *Hazards, Wastes, Diseases, Biological properties, Chemical properties, Physical properties, Psychological aspects, Priorities, Planning, Administration, Management.
Identifiers: *Health, *Environmental hazards, Life support systems, Sociological aspects.

The nature of man-environment relationships, as they affect man's health, is examined. The status of man's health represents the result of complex interactions between his internal biological system and the total external environmental system. Besides deficiencies in life support systems and the danger of improperly handled wastes, man is subjected to a variety of environmental hazards. Some of these hazards are natural, but more often they are the result of man's activities and numbers. The following factors are used to characterize environmental hazards: (1) biological, (2) chemical, (3) physical, (4) psychological, and (5) sociological. A primary objective of environmental control is to prevent disease. Either man must be prevented from confronting the hazard, or the hazard must be removed from the environment. The following fundamental principles of environmental control are generally applicable to the manifestation of environmental hazards: (1) isolation, (2) substitution, (3) shielding, (4) treatment, and (5) prevention. The quality of life is directly related to the quality of the environment. Levels of concern for environmental quality are classified as: (1) bare survival, (2) control of disease and injury, (3) efficient performance, and (4) comfort. (Strachan-Chicago)
W72-06940

COORDINATION OF INDUSTRIAL AIR AND WATER QUALITY PROGRAMS AS AN EFFECTIVE MANAGEMENT POLICY,
RAND Corp., Santa Monica, Calif.
D. P. Tihansky.
Available from the National Technical Information Service as AD-731 261, $3.00 in paper copy, $0.95 in microfiche. Rand report No P-4551; January 1971. 5 p, 1 fig, 3 ref.

Descriptors: *Air pollution, *Water pollution, *Management, Water quality control, *Industries, *Coordination, *Planning, Institutions, Pollution abatement, Methodology, Costs, Standards, Environment.
Identifiers: *Policy making, *Regional problems, Environmental quality control.

Air and water pollution are regional problems whose sources are often observed and studied with little or no overlap. There are distinct governmental institutions established to study these kinds of pollution. Despite the obvious individual properties of both air and water, solutions to air and

water pollution control are similar in approach and methodology. Abatement projects in both cases are instituted for reasons of public health, aesthetics, economics (i.e., by-product recovery), and public relations. The coordination of air and water quality management programs in industry is recommended as an effective approach for the minimization of abatement expenditures as well as schedule delays in meeting pollution control regulations. Historically, legislative decisions on air pollution standards are modeled after watershed treatment methods. A regional authority serves as a receptable for research findings from individual firms and companies in an effort to maximize waste treatment efficiency, to minimize expenditures of abatement projects, and to reduce the length of time necessary for development of a technology suitable for compliance with stringent standards on environmental quality. Coordination of air and water quality programs is equally advantageous within each plant. A figure demonstrates the interconnecting demand and supply relationships for air and water inputs and generated pollutants. By-products of waste treatment systems may be sold to consumers or utilized as inputs within the same firm. (Strachan-Chicago)
W72-06942

ENVIRONMENTAL QUALITY AS AN ADMINISTRATIVE PROBLEM,
Indiana Univ., Bloomington.
For primary bibliographic entry see Field 06E.
W72-06943

THE OPTIMAL CONTROL OF POLLUTION,
John F. Kennedy School of Gevernment, Cambridge, Mass.
E. Keller, M. Spence, and R. Zeckhauser.
Journal of Economic Theory, Vol. 4, No. 1, p 19-34, February 1972. 11 ref, append.

Descriptors: *Pollution abatement, *Control, *Economics, *Theoretical analysis, *Planning, Coordination, Flow, Consumptive use, Pollutants, Optimization, Costs, Benefits, Marketing.
Identifiers: *Optimal control, *Control theory, Centralization, Effluent charges, Pollution rights.

Pollution is defined to be any stock or flow of physical substances which impairs man's capacity to enjoy life. So defined, pollution is a pervasive phenomenon. Traditional economic theory has seen pollution as a problem of externalities. Dealing with the complex problems of pollution requires some form of centralized coordination and control, i.e., an approach beyond that of externalities analysis. The framework of control theory provides insight on the use of mechanisms to direct patterns of consumptive and production. The optimal control of pollution may require curtailment of certain types of consumption. Three distinctions relate to the economic effects of pollutants: (1) whether the pollutant has its major impact on consumption, production, or both, (2) whether the pollutant has its impact as a stock or a flow, and (3) whether the pollutant is a state or control variable. Society is functioning with a pollution level well in excess of the optimal equilibrium. Too much emphasis has been placed on building the capital stock and on maintaining a high level of consumption. A form of centralized coordination to correct a situation which presents inappropriate incentives is needed. Such coordination could be carried out through effluent charges, a market for pollution rights, or through direct control. The models presented indicated that drastic measures are not called for, but a controlled movement toward optimal paths. The role of the economists is to identify paths of optimality and to suggest practical ways in which these paths might be approached. (Strachan-Chicago)
W72-06950

THE ENVIRONMENT: PAST, PRESENT, AND PLUPERFECT,
Johns Hopkins Univ., Baltimore, Md. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 06B.
W72-06951

WATER QUALITY MANAGEMENT PLANNING IN SOUTH CAROLINA.
South Carolina State Planning and Grants Div., Columbia.

Available from the National Technical Information Service as PB-203 589, $3.00 in paper copy, $0.95 in microfiche. HUD Report No. SC-40-0014-0419, September 1971. 43 p, 2 map. HUD SCP-43.

Descriptors: *Planning, *Water quality, *Management, *South Carolina, Sewers, Pollution abatement, Environment, State governments, Local governments, Federal government, Programs, Coordination, Economics, Population.
Identifiers: *Water planning, *Planning manual, Planners, Planning requirements, Coordinated planning program, Framework, Financial assistance.

This planning manual deals specifically with water quality planning and functional water and sewer planning in South Carolina. It is particularly cognizant of the role of the ten district planning and development commissions. Although some consideration of the role of statewide planning is presented, the manual deals primarily with the development of water-related plans at the regional and local level. It is designed for use by regional and local planners in the development of water pollution abatement programs. The manual is divided into two parts. Part I discusses the programs of the Farmers' Home Administration (FMHA), the Department of Housing and Urban Development (HUD), the Environmental Protection Agency (EPA), and the Economic Development Administration (EDA). The programs of each are described, the pertinent planning requirements prerequisite to grant approval are outlined, and past application and current status of these programs within the state are discussed. Part II presents a coordinated planning program designed to meet state, regional, and local planning needs and to satisy federal planning requirements. Planning is necessary if South Carolina communities are to properly serve their growing populations with well-designed and economical water and sewer systems. Water planning must be properly coordinated and reflect both statewide and local conditions. It must reflect environmental concerns and the impact of pollution abatement on economic growth. Finally, such planning must reflect the federal planning requirements prerequisite to necessary federal financial assistance. The manual provides a framework with which to realize these objectives. (Strachan-Chicago)
W72-06953

ENVIRONMENTAL PLANNING: 1 - ENVIRONMENTAL INFORMATION FOR POLICY FORMULATION,
For primary bibliographic entry see Field 06G.
W72-06955

CONFLICTS IN WATER RESOURCES PLANNING.
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 06B.
W72-06958

A SEARCH FOR GOALS IN WATER RESOURCES PLANNING,
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 06B.
W72-06959

WATER RESOURCES INVESTMENT AS NATIONAL GOAL AND ECONOMIC INCENTIVES FOR POLLUTION CONTROL,
D. C. Department of the Interior, Washington.
For primary bibliographic entry see Field 06B.
W72-06966

TWO METHODS OF STUDYING THE EFFECT OF MUNICIPAL SEWER SURCHARGES ON FOOD PROCESSING WASTES,
North Carolina State Univ., Raleigh. Dept. of Economics.
Don E. Ethridge, and J. A. Seagraves.
Economics Research Report No. 18, December 1971. 27 p, 2 fig, 6 ref. OWRR-B-032-NC (1) and A-047-NC (3).

Descriptors: Economic efficiency, *Elasticity of demand, *Prices, *Water demand, Industrial wastes, *Regression analysis, Water utilization, Farm wastes.
Identifiers: *Sewer charges, *Surcharges, *Economic incentives.

Waste treatment charges traditionally have been based on the volume of water consumed. Surcharges based on the strength of industrial wastes discharged into sewer systems are rapidly becoming more common. Estimates of the response of two industries to sewer surcharges are presented and two different empirical procedures used to make such estimates are illustrated. A budgeting approach was used to estimate the responses of sugar beet processing firms to sewer charges based on waste strength. A typical beet processing plant could profitably reduce its water-carried wastes by 75 percent if faced with a charge of $.02 per pound of BOD. Regression analysis was used to estimate the response of poultry processing firms to charges based on waste strength. Firms have responded as one would expect to increases in surcharges and the price of water -- reducing wastes and use of water.
W72-06976

TREATMENT OF ACID MINE DRAINAGE, 'OPERATION YELLOWBOY,'
Dorr-Oliver Inc., Westpoint, Conn.
For primary bibliographic entry see Field 05D.
W72-06977

EMERGENCY WATER SUPPLY FACILITIES FOR THE SCHUYLKILL COUNTY MUNICIPAL AUTHORITY,
Chester Engineers, Pittsburgh, Pa.
For primary bibliographic entry see Field 05F.
W72-06978

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. II, COMPUTATION PROCEDURES,
New York City-Rand Inst., N.Y.
For primary bibliographic entry see Field 05B.
W72-06979

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. III, JAMAICA BAY SIMULATION,
New York City-Rand Inst., N. Y.
J. J. Leendertse, and E. C. Gritton.
R-709-N.Y.C, July, 1971. 73 p, 38 fig.

Descriptors: *Water quality, *Salinity, *Dissolved oxygen, *Biochemical oxygen demand, *Coliforms, *Simulation analysis, Tidal waters, Model studies, Estuaries, Flow, Sea water, New York.
Identifiers: *Jamaica Bay, Long Island (NY).

A water-quality simulation model is presented for studying the effects of combined sewage overflows and other waste discharges on the water quality of Jamaica Bay, Long Island, New York. The experiments made to adjust the tidal flow in the model are described. These simulations indicated that the tide can generate a circulation in the bay. Presented also is a simulation of the transient movements of constituents in the bay.

Distributions of salinity, dissolved oxygen, biochemical oxygen demand and coliform bacteria were computed simultaneously. The results are presented as charts with isocontours indicating the concentration of various substances. The variations of the concentration were considerable, particularly variations in coliform densities. During summer conditions and with dry-weather flow, the computed DO concentrations were less than 3mg/L in the northern part of the bay. The area of low concentration moved with the tide along the northern shore of Jamacia Bay and the DO concentrations were dependent on the general circulation generated by the tide. The BOD concentrations were generally low under these conditions. (See also W71-04038 and W72-06979) (Ligon-Cornell)
W72-06980

CASE STUDIES.
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06A.
W72-06989

THE ROLE OF THE U.S. ARMY CORPS OF ENGINEERS IN WATER QUALITY MANAGEMENT,
Institute for Water Resources (Army), Alexandria, Va.
David J. Allee, and Burnham H. Doge.
Available from the National Technical Information Service as AD-734 833, $3.00 in paper copy, $0.95 in microfiche. IWR Report 71-1, October 1970. 154 p.

Descriptors: *Water quality control, *Water resources development, *Waste treatment, *Planning, Institutional aspects.
Identifiers: *Water quality management.

The water quality management problem in the U.S. and alternative institutional arrangements aimed toward solution of the problem are examined. Emphasis is placed upon the need for Federal regional-scope multiple objective planning. Under the institutional arrangements discussed, benefits derive from: a. Integration of planning for separate functional water needs, e.g., water supply and water quality management, b. Regionalization of waste water systems for groups of communities and large metropolitan areas, c. Institutional and financial arrangements that foster regional solutions, d. A flexible Federal role to match the diversity of conditions across the nation, e. Cost-effectiveness allocation of funds. The role of the Corps of Engineers within the context of various institutional arrangements is visualized largely from its broad planning capability, nationwide organization and strong decentralized field staff, and well-established congressional authorization and budgetary review procedures. The special capabilities of the Corps of Engineers are related to filling gaps in the existing Federal role and overcoming institutional barriers. The report recommends several current urgent problem situations where Corps' assistance could be applied for early demonstration of its special capabilities. (CE)
W72-06997

PHYSICAL, CHEMICAL, AND BIOLOGICAL ASPECTS OF THE DUWAMISH RIVER ESTUARY, KING COUNTY, WASHINGTON, 1963-67,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-06998

IN BALANCE WITH NATURE--A BIOLOGICAL MYTH,
Centro Internacional de Mejoramiento de Maiz y Trigo, Mexico City.
For primary bibliographic entry see Field 06G.
W72-07032

RECYCLING THROUGH HIGHER PLANTS,
King's Coll., London (England). Dept. of Botany.
For primary bibliographic entry see Field 02I.
W72-07054

SHORT-TERM EFFECTS OF 2,4-D ON AQUATIC ORGANISMS IN THE NAKWASINA RIVER WATERSHED, SOUTHEASTERN ALASKA,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
S. Sears, and R. Meehan.
Pesticides Monitoring Journal Vol. 5 No. 2: p. 213-217, September 1971. 1 fig, 2 tab, 5 ref.

Descriptors: *2, 4-D, *Salmonids, *Aquatic insects, *Pesticide toxicity, *Water analysis, Diptera, Mayflies, Stoneflies, Alaska, Pesticide residues.
Identifiers: *Nakwasina River, Southeast Alaska, Vegetation control, Aerial spraying, Coho salmon juveniles, Dolly Varden char.

The Forest Service sprayed 2,4-D at a rate of 2 lbs./acre on land in southeastern Alaska to control red alder. There was no significant immediate mortality to fish (Coho salmon and Dolly Varden) and aquatic insects even in streams that were sprayed directly. Water samples and fish tissue samples analyzed for 2,4-D content showed concentration levels below those considered lethal.
W72-07071

TIDAL FLUSHING SYSTEM,
W. J. Josephs.
U. S. Patent No. 3,492,822, 2 p, 2 fig, 3 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 1, p 64, February 3, 1970.

Descriptors: *Patents, *Tidal waters, Bays, Engineering structures, *Coastal engineering, Intake gates, Channels, Gate control, *Harbors, Outlets, *Silting, Pollution abatement, Water pollution control.
Identifiers: *Tidal flushing, San Francisco Bay.

A man-made horseshoe shaped channel designed to extend around a bay will contain one or more intake control gates and outfall or discharge gates. These may be opened or closed selectively to provide for flushing of a bay or inlet to prevent sand or silt build up in the harbor mouth. Man-made islands will be used to assist in effecting circulation, agitation and flushing of otherwise stagnant water. (Sinha-OEIS)
W72-07092

AGRICULTURAL INSECTICIDES AS A POTENTIAL WATER POLLUTANT,
West Virginia Pulp and Paper Co., New York.
For primary bibliographic entry see Field 05F.
W72-07097

THE OPTIMAL CONTROL OF POLLUTION,
John F. Kennedy School of Government, Cambridge, Mass.
E. Keeler, M. Spence, and R. Zeckhauser.
Journal of Economic Theory, Vol. 4, No. 1, p 19-34, 1971. 3 fig, 11 ref, 1 append.

Descriptors: *Pollution abatement, *Mathematical models, *Dynamics, Pollutants, Optimization.
Identifiers: *Optimal control theory, Pontryagin maximum principle.

Optimal control theory is used to determine optimal equilibria and approach paths for each of two related models in which it is desirable to control the stock of pollution. The objective function for the two models is the same. In particular, it is a social welfare function which is responsive to the aggregate consumption flow and to the stock of pollution. The first has labor and a single capital good as the two productive factors. Output may be devoted not only to capital accumulation and consumption, but also to reduce the stock of pollution. The Pontryagin maximum principle is applied to derive the necessary conditions for an optimal time path. Two equilibriums are possible in this model, one in which pollution is controlled only by natural processes, and one in which expenditures are made on pollution control. In the second model, pollution enters the production function as a flow with a positive marginal product (DDT., for example). This model points out that just as it is not optimal to ignore the pollution problem, neither is it optimal to ban the flow of the pollutant forever. The models indicate the importance of a controlled movement toward optimal paths. (Settle-Wisconsin)
W72-07112

REGIONALISM - SENSE AND SAVINGS,
Central Connecticut State Coll., New Britain. Dept. of Economics; and State Univ., of New York, Albany.
For primary bibliographic entry see Field 06C.
W72-07115

SOCIAL PURPOSE TAXATION, A POLICY PROPOSAL.
Detroit City Plan Commission, Mich.

Available from the National Technical Information Service as PB-202 194, $3.00 in paper copy, $0.95 in microfiche. April, 1971. 138 p, 3 tab.

Descriptors: *Pollutants, *Social impact, *Environmental effects, *Taxes, Social adjustment, Economic efficiency, Michigan.
Identifiers: Detroit (Michigan).

The concept of the social purpose tax is considered, and several examples of its potential application are given. Social purpose taxes are defined as taxes on goods or activities which (1) have detrimental public or environmental effects, (2) have high social costs, or (3) are activities which the community wishes to curtail but cannot effectively prevent through legal restrictions. These taxes could be a significant source of municipal revenue which could be used to correct the social conditions relating to the items taxed. Social purpose taxation is a variation of the cost-benefit concept, which implies that those goods and activities which contribute disproportionately to the costs of society should shoulder a fairer share of the public tax burden. Nineteen activities are considered to be, among many others, likely candidates for this taxation approach. These candidates include 'throwaway' bottles and cans, high phosphate detergents, leaded gasoline, rock salt usage, electric power consumption, high sulfur coal, natural gas consumption, visual pollutants and hazards, and automobile congestion. Estimates indicate that if all nineteen taxes were instituted in Michigan, they would increase state revenues by about $380 million. (Settle-Wisconsin)
W72-07119

IRRIGATION RESIDUES,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05B.
W72-07122

1971 NEW PRODUCTS REVIEW.

Industrial Water Engineering, Vol. 9, No. 1, p 4, 8, 17-30, January 1972. 27 fig.

Descriptors: *Instrumentation, *Water quality, *Water analysis, *Monitoring, Waste water treatment, Measurement, Separation techniques, Oily water, Intakes, Pipes, Valves, Conductivity, Flow control, Flow measurement, Ion exchange, Water softening, Oil, Hydrogen ion concentration, Centrifugal pumps, Reverse osmosis, Sludge treatment, Mercury, Organic materials, Spectrophotometry, Turbidity, Dissolved solids, Water quality control, Laboratory equipment.

Identifiers: Recorders, Ion selective electrodes, Deionization, Sensors, Liquid level sensor, Intake systems, Arsenic, Catalog, Removal.

New products for water treatment, analysis, and pollution control are presented in catalog format. Brief descriptions of capabilities are included. (Mortland-Battelle)
W72-07130

SYSTEMS STUDY OF OIL SPILL CLEANUP PROCEDURES. VOLUME I: ANALYSIS OF OIL SPILLS AND CONTROL MATERIALS,
Dillingham Corp., La Jolla, Calif. Applied Oceanography Div.
G. A. Gilmore, D. D. Smith, A. H. Rice, E. H. Shenton, and W. H. Moser.
Available from American Petroleum Institute, 1271 Ave. of the Americas, New York 10020. Final Report, Publication No. 4024 February 1970. 89 p, 13 fig, 9 tab, 4 append. Contract OS-1.

Descriptors: *Oil wastes, *Water pollution effects, Atlantic Ocean, Gulf of Mexico, Waves (Water), Winds, Tides, Currents (Water), Water temperature, Barriers, Aquatic drift, Oil.
Identifiers: *Oil spills, Atmospheric conditions, Oil booms, Skimmers, Pneumatic barriers, Absorbent materials, Straw, Dispersants, Chemical treatment, Gelling agents, Combustion agents, Cleanup, Recovery, Crude oil.

Past oil spills were analyzed in order to better understand the basic characteristics of oil spills and to evaluate equipment, material, and techniques for treating and controlling them. It was found that most oil spills are crude or residual oil from tankers, occur within 10 miles of shore, and involve more than 5,000 barrels. They generally occur no more than 25 miles from port, probably last more than 5 days, and are likely to contaminate no more than 3 to 4 miles of shore, which is probably at least partially recreational. Future spills are most likely in the Atlantic Coast region from Maine to Virginia and in the Gulf of Mexico from Mobile to Brownsville. Waves and wind are the environmental factors that most affect oil spills. High waves limit cleanup and winds control the direction and speed of drift. The environmental effects of isolated spills, while locally severe, appear to be naturally dissipated in a short time. Oil booms are not considered effective in containing floating oil and pneumatic barriers are suitable only for fixed installations. Floating-oil recovery devices and skimmers are not effective in major spills. Straw is a very effective absorbent and steonate-treated chalk serves as an effective sinking material. Several chemical dispersants have proved useful. Combustion-promoting agents are also available for burning open-water spills. Selected references on oil spill control and primary literature sources are listed. (Mortland-Battelle)
W72-07133

THE DISPERSION OF MATTER IN TURBULENT PIPE FLOWS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 05B.
W72-07138

PRESSING OUT THE LAST BIT OF POLLUTION.
For primary bibliographic entry see Field 05D.
W72-07172

MANAGEMENT OF FRENCH PETE CREEK, WILLAMETTE NATIONAL FOREST, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Forest Service (USDA), Washington, D. C.
For primary bibliographic entry see Field 04D.
W72-07179

CALVERT CLIFFS' COORDINATING COMM, INC. V. ATOMIC ENERGY COMM. (FULL CONSIDERATION OF ENVIRONMENTAL EFFECTS IN ADMINISTRATIVE DECISION MAKING).
For primary bibliographic entry see Field 06E.
W72-07191

KEMP FEDERAL WATER POLLUTION CONTROL BILL,
Congress, Washington, D.C.; and House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-07192

REFUSE ACT PERMIT PROGRAM.
Congress, Washington, D.C.; and Committee on the Environment (U. S. Senate).

Hearings, 92d Cong, 1st Sess, February 18, 19, 1971. 219 p, 4 tab, 17 ref.

Descriptors: *Water pollution control, *Pollution abatement, *Federal government, *Permits, *Rivers and Harbors Act, Water quality control, Waste water (Pollution), Legislation, Administration, Regulation, Water pollution, Water quality, Environmental sanitation, Water resources, Water policy, Waste disposal, Water law, Legal aspects, Federal Water Pollution Control Act.
Identifiers: *Refuse Act.

Based upon the Refuse Act of 1899, the Administration has issued orders for the implementation of a refuse discharge permit plan to control waste disposal in navigable waters. Testimony is herein presented from spokesmen for the Department of the Army and the Environmental Protection Agency regarding their respective roles in the issuance and denial of permits. Attorneys from the Justice Department testified on the administrative and enforcement role of the Justice Department. Spokesmen for Businessmen for the Public Interest, the Natural Resources Defense Council, Friends of the Earth, the National Wildlife Federation, and the National Audubon Society attacked the program as being too weak. Congressman Reuss inserted a background and summary of the Administration's permit plan. This criticized the plan as being incomplete and inadequate because it restricted applicability of environmental protection factors under other laws, and failed to provide adequate public participation. (Brackins-Florida)
W72-07193

A REGULATION REQUIRING THE SUBMISSION OF ENGINEERING REPORTS AS A PART OF APPLICATIONS FOR THE DISCHARGE OF SEWAGE AND/OR INDUSTRIAL WASTES AND FOR THE CONSTRUCTION OR ALTERATION OF TREATMENT WORKS OR OUTLETS OR FOR THE INCRE ASE OF LOAD THROUGH EXISTING TREATMENT WORKS OR OUTLETS.
South Carolina Pollution Control Authority, Columbia.

Rules and Regulations, PC-W-Regulation 2, Pursuant to Section 70-108, South Carolina Code 1962. 3 p.

Descriptors: *South Carolina, *Administrative agencies, *Permits, *Treatment facilities, *Water pollution control, *Sewage disposal, Regulation, Legislation, Sewers, Legal aspects, Public health, Cities, Environmental engineering, Industrial wastes, Project planning, Engineering personnel, Engineering structures, Administrative decisions, Municipal wastes.

Any person intending to begin the discharge of sewage and/or industrial wastes into state waters, to increase the amount of such discharges, or to construct new treatment facilities, or additions thereto, shall make application to the South Carolina Pollution Control Authority. An engineering report shall be submitted and prepared in accordance with rules stated herein. Such reports shall describe the proposed works, its purpose, and steps which will be taken to control water pollution. Reports must be approved and a construction permit issued before construction work is begun. (Doise-Florida)
W72-07194

ENFORCEMENT OF ENVIRONMENTAL LAW ON THE LOCAL LEVEL,
Metropolitan Sanitary District of Greater Chicago, Ill.
A. S. Lavin.
In: Environmental Law, The Institute of Continuing Legal Education, Ann Arbor, Michigan, 1971, p 89-97.

Descriptors: *Local governments, *Pollution abatement, *Law enforcement, *Penalties (Legal), Water pollution control, Public rights, Legislation, Administrative agencies, Water quality, Standards, Effluents, Legal aspects, State governments, Regulation, Judicial decisions, Adjudication procedure, Non-structural alternatives.
Identifiers: *Injunctions (Prohibitory).

Environmental law enforcement should be primarily at the local level: local governments are better situated to evaluate and understand such problems. Area inhabitants have an inherent right to determine the type of community they want and, accordingly, pollution control standards. The public must be educated as to the signs of pollution and encouraged to report their presence. Effluent criteria are the best means of effecting compliance by individual polluters; the most effective forum for compelling pollution abatement is the courtroom. Judges are willing to assist and polluters are aware of the effects of adverse publicity. Problems, however, are encountered in judicial enforcement: (1) the burden of proof is not on the polluter, who is in the best position to know material facts; and (2) judges are reluctant to shut down production in order to stop pollution. Court orders to force polluters to apply profits to pollution abatement, more substantial fines, and jail sentences for corporate officers should be utilized. A tough and clear enforcement philosophy must be adopted by the enforcement agency. (Doise-Florida)
W72-07195

TEXACO, INC. V. HICKEL (VALIDATION OF STATE LEASE EXISTING BEFORE SUBMERGED LANDS ACT).
For primary bibliographic entry see Field 06E.
W72-07197

UNITED STATES V. PENNSYLVANIA INDUSTRIAL CHEMICAL CORP. (CONSEQUENCES OF GOVERNMENT'S FAILURE TO ESTABLISH REFUSE ACT PERMIT PROCEDURES).
For primary bibliographic entry see Field 06E.
W72-07199

GENERAL DESIGN CRITERIA FOR NUCLEAR POWER PLANTS,
Atomic Energy Commission, Washington, D.C.
W. B. McCool.
Federal Register, Vol. 36, No. 35, p. 3255-3260, February 1971.

Descriptors: *Thermal pollution, *Nuclear powerplants, *Nuclear reactors, *Design criteria, *Water quality control, Radioactive wastes, Construction, Water cooling, Design standards, Heating, Leakage, Thermal insulation, Treatment facilities, Electric powerplants, Adoption of particles, Administrative agencies, Administrative decisions.

The Atomic Energy Commission has adopted an amendment adding general design criteria to its regulations for the licensing of nuclear power

plants. Such design criteria include standards which the reactor coolant system must meet as a safeguard against thermal pollution. A reactor coolant makeup system to supply reactor coolant makeup for protection against small breaks in the reactor coolant pressure boundary is required. Reactor containment systems shall be provided to establish an essentially leaktight barrier against uncontrolled release of radioactive wastes into the environment. For protection from excess heat in the event of a loss-of-coolant accident, a residual heat removal system to transfer residual heat from the reactor core must be provided. Moreover, a system to provide emergency core coding is required. There shall also be provided a containment heat removal system to remove heat from the reactor containment. The plant design shall include means to control the release of radioactive materials and to handle radioactive solid wastes. (Brackins-Florida)
W72-07200

BOROUGH OF AMBLER V. SHEPHERD (DUTY OF MUNICIPALITY TO MAINTAIN STREAMFLOW IN STREAM USED TO CARRY THE MUNICIPAL SEWAGE).
278 A.2d 886-890 (Pa. Sup. Ct. 1971).

Descriptors: *Pennsylvania, *Retaining walls, *Streams, *Sewage disposal, Judicial decisions, Remedies, Damages, Legal aspects, Local governments, State governments, Sewage, Municipal wastes, Sewers, Riparian rights, Streambeds, Streamflow, Water pollution, Water pollution sources.

Plaintiff Borough sought an injunction compelling defendant riparian owner to remove portions of a retaining wall which had fallen into a creek and to repair the original wall. The wall was on defendant's land and provided an embankment for the creek. It had deteriorated, collapsed into the creek, and partially obstructed the creek's flow. Plaintiff alleged that the retaining wall constituted a nuisance and that the Borough was empowered to seek an injunction requiring defendant to clear the stream and correct the structure. Defendant contended the Borough had the duty to remove all debris from the creek and to maintain the wall, since plaintiff had incorporated the creek into its surface sewer system. The municipality was held to have the duty to keep the stream open and prevent accumulation of filth because of the stream's use as an open sewer. However, if the city could prove the existence of a nuisance, responsibility for maintaining the wall would be upon defendant. (Horwitz-Florida)
W72-07201

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1971.
Congress, Washington, D.C.; and Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-07204

ENVIRONMENTAL LAW--WATER RESOURCES--ZONES OF SHARED CONSERVATION AUTHORITY AND UNITED STATES PUBLIC POLICY,
M. R. Schoenenberger.
North Carolina Law Review, Vol. 49, p. 978-984, August 1971. 31 ref.

Descriptors: *Federal Water Pollution Control Act, *Governmental interrelations, *Water resources devleopment, *Federal-state water rights conflicts, *Pollution abatement, Legal aspects, Legislation, Water pollution, Institiutional constraints, Federal government, Interstate commissions, State governments, River basin development, Navigable waters, Multiple purpose projects, Water conservation, Adoption of practices, Interstate compacts, Water policy, Law enforcement.

The development of legal authority to regulate use of the nation's waterways is herein examined. Early case law established that the federal government has authority to regulate all navigable waterways. An important limitation is that title to all navigable waters and their beds is vested in the states. Early federal pollution control legislation was not effectively enforced for many years. Areas of shared authority between federal and state governments are examined in the context of their response to water resources conservation pressures. The multiple-use doctrine of the Federal Power Act is one way to compromise various interests. State compacts for river basin development are another. Gradually, federal power over river basin planning and development has been recognized. The threat of water pollution is recognized in the new focus on shared authority. The Federal Water Pollution Control Act is a cumbersome device for institutional enforcement. A more integrated enforcement system is needed. Enactment of recent House recommendations would strengthen the Act, but the Act's basic fault is the enforcement is not a nationally controlled function. (Grant-Florida)
W72-07205

POWER AND THE ENVIRONMENT: A STATUTORY APPROACH TO ELECTRIC FACILITY SITING,
For primary bibliographic entry see Field 06G.
W72-07206

THE USE OF QUI TAM ACTIONS TO PROTECT THE ENVIRONMENT,
Kafin and Needleman, Glen Falls, New York.
For primary bibliographic entry see Field 06G.
W72-07207

QUI TAM ACTIONS UNDER THE 1899 REFUSE ACT: POSSIBILITY OF INDIVIDUAL LEGAL ACTION TO PREVENT WATER POLLUTION,
C. M. Drennan.
Missouri Law Review, Vol. 36, p. 498-513, Fall 1971. 95 ref.

Descriptors: *Rivers and Harbors Act, *Water pollution control, *Law enforcement, Wastes, Legal aspects, Judicial decisions, Legislation, Federal government, Navigable waters, Effluents, Water law, Waste water (Pollution), Remedies, Permits, Environmental sanitation, Bodies of water, Water pollution, Public health, Penalties (Legal), Legal review, Adjudication procedure, Institutional constraints.
Identifiers: *Qui tam actions, *Refuse Act, Injunctions (Prohibitory).

The Refuse Act is an old but effective tool in the environmental lawyer's arsenal. Recent concern has centered around bringing qui tam actions to enforce the Act. The scope of the Act is discussed, including its jurisdiction, the meaning of refuse, type of discharges covered, remedies available, and proper means of enforcing the Act. Qui tam actions are defined as civil actions brought by an individual to obtain his share of a statutorily authorized penalty. The history and purpose of qui tam actions are discussed. Case law bearing on the propriety of qui tam actions under the Refuse Act is analyzed. The cases are not clear. A recent House of Representatives Committee memorandum, however, states that the Act permits such actions. Public policy clearly seems to favor permitting such actions. All attempts to bring qui tam actions under the Refuse Act, however, have failed. By failing to allow qui tam actions, courts have rendered useless a valuable tool in preventing water pollution. If such rulings are upheld, the private individual seeking to enforce the Refuse Act would have only one remaining alternative: mandamus actions against the district attorney. Hopefully, appellate courts will reverse present qui tam decisions. (Grant-Florida)
W72-07208

OIL POLLUTION BY SHIPS AND FREEDOM OF THE HIGH SEAS,
Tel-Aviv Univ. (Israel).
Y.Dinstein.
Journal of Maritime Law and Commerce, Vol. 3, p. 363-374, January 1972. 12 p, 54 ref.

Descriptors: *International law, *Law of the sea, *Ships, *Oil pollution, *Oil spills, Water pollution sources, International waters, Oil industry, International commissions, Admiralty, Governments, Judicial decisions, Legal aspects, Continental shelf, Effluents, Jurisdiction, Treaties, Institutional constraints, Political aspects, Water law, Remedies, Coasts, Legal review.
Identifiers: *Contiguous zone.

Oil pollution of the high seas from ships outside territorial waters causes a conflict between freedom of the seas and the interests of coastal states. The 1962 London Convention amendment creates a special prohibited zone of 100 miles in which oil dumping is proscribed. Prohibitions are enforceable only by the flag state of the offending ship. Special exceptions and restrictions on these provisions are explained. The 1969 Brussels Convention permits self-help by the coastal state on the high seas to prevent harm to its shores from potential oil pollution. Presumably this includes sinking the offending ship. International conflict may be promoted by this provision. A total prohibition of pollution of the high seas is needed. Each state must punish its own offenders, and absolute liability should fall on the state of each offender. An international panel should decide when to sink offending ships. The term flag state should be more meaningfully defined. (Grant-Florida)
W72-07210

A PRIMER ON ENVIRONMENTAL LITIGATION,
Speiser, Shumate, Geoghan, Krause, and Rheingold, New York.
For primary bibliographic entry see Field 06G.
W72-07217

A PRELIMINARY ECOLOGICAL STUDY OF AREAS TO BE IMPOUNDED IN THE SALT RIVER BASIN OF KENTUCKY,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 04A.
W72-07224

ECONOMIC ASPECTS OF THERMAL POLLUTION CONTROL IN THE ELECTRIC POWER INDUSTRY,
Pacific Northwest Water Lab., Corvallis, Oreg.
Alden G. Christianson, and Bruce A. Tichenor.
Available from the National Technical Information Service as PB-208 434, $3.00 in paper copy, $0.95 in microfiche. Working Paper No 67, September 1969. 13 p, 3 tab, 9 ref. FWPCA Program 16130---09/69.

Descriptors: *Thermal pollution, *Electric power costs, Water pollution control, *Water cooling, *Thermal power plants.
Identifiers: *Once-through cooling system, *Closed-cycle cooling system.

Most new thermal power plants will use cooling devices. The economic impact of cooling, how it affects the power industry and the consumer, is discussed. Data and analyses show that the cost of providing thermal pollution control is not a restrictive factor in the production of electricity. Incremental increases in the production cost of electricity from plants with closed-cycle cooling over those with once-through fresh-water cooling are not excessive. More importantly, the impact of thermal pollution control on the consumer cost of electricity is minimal.
W72-07246

HOUSEBOAT WASTE CHARACTERISTICS AND TREATMENT,
Pacific Northwest Water Lab., Corvallis, Oreg.

For primary bibliographic entry see Field 05D.
W72-07250

HOUSEBOAT WASTES: METHODS FOR COLLECTION AND TREATMENT,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05D.
W72-07251

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

EMPIRICAL STUDY OF ECONOMIC-ECOLOGIC LINKAGES IN A COASTAL AREA,
Clemson Univ., S.C. Dept. of Agricultural Economics; and Georgia Inst. of Tech., Atlanta. Environmental Research Center.
J. D. Hite, and E. A. Laurent.
Water Resources Research, Vol 7, No 5, p 1070-1078, October, 1971. 6 tab, 11 ref, 1 append.

Descriptors: *Input-output analysis, *Industrial production, *Environmental effects, *City planning, Regional analysis, Cost-benefit analysis, Economics.
Identifiers: *Economic growth, Leontief inverse, Charleston (South Carolina).

An input-output model was adapted to estimate the environmental impact of economic growth in the Charleston, South Carolina, metropolitan area. Two essential elements of the model were used: (1) the Leontief inverse of a regional input-output matrix, and (2) a matrix showing the inflow from the environment and the residual outflow to the environment associated with one dollar of gross output of each sector in the input-output matrix. A 28-sector input-output matrix was constructed from 1968 survey data. The environmental matrix was constructed from both survey data and secondary sources for 16 types of environmental inputs or residuals. The basic operation involves post-multiplying the environmental linkages matrix by the Leontief inverse. The matrix resulting from this operation provides estimates of direct and indirect environmental linkages. All economic sectors studied had either direct or indirect environmental linkages and were responsible for some level of environmental resource usage. Environmental-income multipliers were also derived. These multipliers estimate the environmental repercussions of a change of one dollar in local income arising from each sector. They also provide information on which industry will generate the most local income with the least environmental emissions for the region. (Settle-Wisconsin)
W72-06585

THE SYSTEMS APPROACH IN URBAN PLANNING,
Barton-Aschman Associates, Inc., Chicago, Ill.
D. G. Stuart.
Planning Advisory Service Report No. 253, American Society of Planning Officials, January 1970. 63 p, 4 fig, 8 tab, 1 append, 29 ref.

Descriptors: *Planning, *Systems analysis, *City planning, *Programs, *Evaluation, Decision making, Measurement, Application methods, Data collections, Mathematical models, Statistical models, Costs, Forecasting.
Identifiers: *Urban planning, Policy making, Operational problems, Guidelines, Alternative programs.

Application of the systems analysis approach to urban planning is discussed. A framework for utilizing the systems approach is outlined, the steps or phases of analysis that are fundamental to the systems approach are identified, and guidelines are developed that stress the operational problems involved. The systems approach is divided into four steps: (1) identifying objectives, (2) identifying programs, (3) predicting effectiveness, and (4) evaluating alternatives. Under (1), the five guidelines are: quantitative expression of objectives, consistent and comparable definitions of objectives, definition of different sets of objectives within the same subject area, exploration of different quantitative measures for the same objective, and the correlation between the specificity of an objective and programming. Under (2), the five guidelines are: expression of programs in terms of the objectives to which they apply, application of programs to more than one objective, definition of programs in consistent and comparable terms, need for a common unit of input measurement, and identification or design of alternative programs. Under (3), the five guidelines are: interdependency of objectives, interdependency of programs, data collection on program-objective characteristics and interrelationships, maintaining mathematical modeling and statistical analysis at a manageable level, and use of assumed or approximated prediction. Under (4), the five guidelines are: comparison of program costs with relative levels of effectiveness, assignment of subjective weights among objectives, development of a single score to evaluate alternative programs, non-quantitative objectives, and systems analysis as an aid to governmental decision making. (Strachan-Chicago)
W72-06947

THE EFFICACY OF A COORDINATED PLAN: THE TEXAS PLANNING MODEL,
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 06B.
W72-06963

APPLICATION OF OPERATIONS RESEARCH TECHNIQUES FOR ALLOCATION OF WATER RESOURCES IN UTAH,
Utah Water Research Lab., Logan.
C. G. Clyde, A. B. King, and J. C. Andersen.
Available from the National Technical Information Service as PB-208 222, $3.00 in paper copy, $0.95 in microfiche. Final Report PRWG-73-2, September 1971, 133 p, 46 fig, 15 tab, 68 ref, 3 append. OWRR B-027-UTAH (1).

Descriptors: *Water allocation (Policy), *Water utilization, *Optimization, *Planning, *Water management (Applied), *Operations research, *Utah, Water storage, Water transfer, Water requirements, Water supply, Municipal water, Industrial water, Wetlands, Groundwater recharge, Water reuse, Mathematical models, Linear programming.
Identifiers: *Simplex method, Cost minimization, State water plan, Political factors, Optimal allocation, Agricultural water use.

A methodology is described for determining the optimal allocation of water supplies in the state of Utah to minimize the cost of meeting an assumed set of requirements. A linear programming model was formulated to represent the ten interconnected hydrologic study areas of the state. The comprehensive model considers virtually all uses, areas, sources, transfers and costs of water. The model has 204 constraints and 338 variables and was solved by the simplex method. Included in the results are the following: the optimal water allocation or the groundwater, surface water, and water transfers which minimize the cost the shadow prices of the resources; sensitivity analyses to identify the critical cost coefficients in the optimal solution; parametric analyses to test the effects of changing constraints; and manipulations of the model to test other factors such as operating rules, legal policies, political and institutional limitations. The tabulated data were carefully condensed so as to be more easily understood. Flow diagrams and graphs summarize the important information. The work is fully documented so others can follow what was done and improve the method or apply the model to other areas.
W72-06972

SYSTEMS ANALYSIS IN WATER RESOURCES PLANNING.
Meta Systems, Inc., Cambridge, Mass.

Report prepared for the National Water Commission, Arlington, Va., July 1971. 393 p, 17 fig, 27 tab. NWC 71-015.

Descriptors: *Systems analysis, *Water resources, *Planning, *Mathematical models, *Model studies, *Optimization, *Simulation analysis, *Decision making, Analytical techniques, Land use, Computers, Multiple purpose, Linear programming, Probability, Statistics.

The use of systems analysis in water resource planning is examined. The systems approach is not limited to the construction and solution of formal mathematical models. Some characteristics of water resource systems are examined and the concept of a system is explored. The scope, time, space and objectives of water resources planning problems are described, and their implications for a systems approach to problem solution. Mathematical modeling techniques are discussed with general but concise treatment of models or idealized representation. A series of model sets are introduced; subsets are then discussed which have been frequently applied in planning: analytical optimization techniques, multivariate analysis, simulation, and search techniques. A number of data and analysis issues are explored, and some specific systems studies are described. Recommendations are made for increasing the usefulness of systems application in water and related land use planning. Among the recommendations are: well-designed courses linking the systems approach to traditional techniques; staff training, if necessary, to provide continuing systems planning capability within agencies; and in general maintaining a balance between modeling in extreme detail or with overly broad assumptions. (See also W72-06985 thru W72-06989) (Campbell-Cornell)
W72-06984

SYSTEMS ANALYSIS: SOME CHARACTERISTICS, HISTORY, AND AREAS OF APPLICATION.
Meta Systems, Inc., Cambridge, Mass.

In: Systems Analysis in Water Resources Planning, July 1971. p 6-25.

Descriptors: *Systems analysis, *Water resources, *Planning, *Mathematical models, *Decision making, *Water quality, Management, Engineering, Economics, Public benefits.

Certain distinguishing characteristics of systems analysis are identified and some procedures of the approach are illustrated. There are three essential characteristics: the systems orientation, the use of interdisciplinary teams, and a preference for formal mathematical models. Systems analysis was developed by the military, so its application to social problems must be approached with caution. In water management, the computer can help to identify and solve problems. But the problems of water management are ultimately problems of investment in the public sector, and larger and more comprehensive models are needed to cope with them. More and more attention is being given to the fact that many compounds other than water flow in streams; research is tracing such compounds and attempting to incorporate them into the systems models. (See also W72-06984) (Campbell-Cornell)
W72-06985

CHARACTERISTICS OF WATER RESOURCE SYSTEMS AND IMPLICATIONS FOR SYSTEMS ANALYSIS PLANNING.
Meta Systems, Inc., Cambridge, Mass.

In: Systems Analysis in Water Resources Planning, July 1971. p 26-51, 1 fig, 1 tab.

Descriptors: *Systems analysis, *Water resources, *Water resources development, *Planning, *Model studies, *Analytical techniques, Investment, Public benefits, Economics.

The concept of a system, is set forth and the nature of water resource systems discussed. The scope, time, space and objectives of water planning problems are described and their implications for a systems approach. Three important market imperfections that influence investment in water resource development are: externalities, public goods, and merit wants. The emergence of new techniques of analysis should shift the emphasis toward the pre-investment and investment studies. The newer methods also enable the planner to make many more comprehensive studies at all stages of the process than was previously possible. (See also W72-06984) (Campbell-Cornell)
W72-06986

MATHEMATICAL MODELS, EXAMPLES OF SOME SYSTEMS ANALYSIS TECHNIQUES.
Meta Systems, Inc., Cambridge, Mass.

In: Systems Analysis in Water Resources Planning, July 1971, p 52-176, 1 fig, 6 tab.

Descriptors: *Systems analysis, *Water resources, *Planning, *Mathematical models, *Decision making, *Optimization, *Simulation analysis, *Analytical techniques, Model studies.

Mathematical models useful in systems analyses are discussed along with the many modern operational mathematical techniques. Discussions center on analytical techniques of mathematical optimization, multivariate analysis, simulation and search techniques. This heavy utilization of standard techniques, rather than a set of standard packages, is what has evolved in the history of systems applications to water resource planning. But because planning problems are often complicated by multi-objective factors, a set of linked models is often most useful. The models may be nested so that outputs of one model are inputs of another. The flow of information for all the nested models eventually leads to the decision process. (See also W72-06984) (Campbell-Cornell)
W72-06987

DATA AND ANALYSIS.
Meta Systems, Inc., Cambridge, Mass.

In: Systems Analysis in Water Resources Planning, July 1971. p 177-254, 9 fig, 16 tab.

Descriptors: *Systems analysis, *Water resources, *Planning, *Mathematical models, *Simulation analysis, *Decision making, *Analytical techniques, *Stochastic processes, Radioactive wastes, Pollutants.

The need for improving the data base and/or extending the analysis is discussed. Issues concerning both physical and socioeconomic data are described. Simple models are presented to demonstrate the use of a few mathematical analysis techniques. How decision theory is an analytic structure for dealing with uncertainty is illustrated. Applications of applied statistical decision theory to the general area of water resource design include the evaluation of evidence based on hydrologic considerations and inputs weighted by the political process. An example of a simulation model complex enough (stochastic and non-linear) to deal with the same issues is presented. The objective of this particular simulation is to determine long-term averages and variations in concentrations of radioactive pollutants. (See also W72-06984) (Campbell-Cornell)
W72-06988

CASE STUDIES.
Meta Systems, Inc., Cambridge, Mass.

In: Systems Analysis in Water Resources Planning, July 1971. p 255-359, 6 fig, 4 tab.

Descriptors: *Systems analysis, Water resources, *Water quality control, *Planning, *Mathematical models, Basins, Estuaries, Analytical techniques.
Identifiers: *Delaware Estuary, *North Atlantic regional framework, *Ganges-Brahmaputra Basin.

Case studies are presented of planning efforts in which the systems approach has played a major role. The cases are examples of four different types of planning problems. The first is the Delaware Estuary Comprehensive Study. The main problem was one of water quality management for the estuary of a single basin. Next is a series of subsystem analysis studies dealing with various problems in urban water resource planning. Then the North Atlantic Regional Study is discussed. It was a Federal-State multiobjective, multi-purpose planning effort. Last is a discussion of the Ganges-Brahmaputra Basin Studies. (See also W72-06984) (Campbell-Cornell)
W72-06989

ECONOMETRIC MODEL FOR RIVER BASIN PLANNING,
For primary bibliographic entry see Field 04A.
W72-07110

THE OPTIMAL CONTROL OF POLLUTION,
John F. Kennedy School of Government, Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W72-07112

OPTIMAL SYSTEMS DESIGNING FOR EFFICIENCY IN KASHMIR'S RENEWABLE RESOURCE USE,
Sardar Patel Univ., Vallabh Vidyanagar (India).
M. K. Muthoo.
Artha-Vikas, Vol. 60, No. 2, p 1-31, July, 1970. 61 ref, 2 append.

Descriptors: *Resources, *Economic efficiency, *Mathematical models, Cost-benefit analysis, Optimization, Discount rate.
Identifiers: *Resource use, *Renewable resources, Mathematical programming.

Mathematical programming techniques are employed to study the problem of how to efficiently use renewable resources. In Kashmir there are 23 main renewable resource uses, including peasant and some cash-crop farming, horticulture, sericulture, forestry, grazing, and livestock-rearing. The resource system extends over about 3.21 million acres. The feasibility of adjusting the present use pattern is investigated in three steps: identification of the bio-technical possibilities of resource use, benefit-cost analyses for ranking the options, and optimization. The model includes 87 land types, 23 commodities, and a varying number of techniques per land type-commodity combination. The total number of activities considered are 1187; however, those with benefit-cost ratios less than unity are excluded from programming. Also, the model incorporates multiple objective functions. These include three sets of benefit-cost ratios at constant discount rates of 5, 10 and 15 percent over the planning horizon, and two sets at changing discount rates. The latter are 15 and 10 percent for the first 15 years, and 10 and 5 percent, respectively, for the next 15 years. (Settle-Wisconsin)
W72-07118

6B. Evaluation Process

A NOTE ON CRITERION FOR SELECTION OF IRRIGATION PROJECTS,
For primary bibliographic entry see Field 03F.
W72-06581

POPULATION ABSORPTION AND REGIONAL WATER MANAGEMENT,
L. G. Smith.
Journal of the American Water Works Association, Vol 63, No 9, p 581-585, September, 1971.

Descriptors: *Urbanization, *Water resources, *Regional development, Population, Waste treatment, Water supply, Planning, Southeast U.S.
Identifiers: *Regional planning.

If U.S. society is to become more healthy, the present course of urban growth must be radically changed. This change can best be achieved by creating attractive and viable communities that retain their identity without sacrificing basic human needs. In particular, these communities must establish practical limits of size and density, and instead of continued lateral expansion cities should maintain open spaces between themselves. Planners must recognize and respect the carrying capacities of limited land and water resources. Second, these new communities should be located on the high points in the drainage system so that waste nutrients could be absorbed by agriculture down slope from the cities. Third, these communities might be served by a network of major water conduits that would tap streams high in their courses where water quality is comparatively good. Also, an integral part of this new city water-supply network would be the construction of complete sewage and waste-treatment conversion plants for each cluster of related communities. Regions where this type of city water-supply network would be most feasible are the South Atlantic and Gulf coastal region, part of the high plains, and part of the central lowlands. (Settle-Wisconsin)
W72-06583

ECONOMIC AND ENVIRONMENTAL EVALUATION OF DEVELOPMENT ALTERNATIVES FOR BEAUFORT COUNTY, SOUTH CAROLINA,
Clemson Univ., S.C. Water Resources Research Inst.
J. C. Hite, W. W. Hall, Jr., and J. M. Stepp.
Available from the National Technical Information Service as PB-208 032, $3.00 in paper copy, $0.95 in microfiche. Report No. 23, February 1972. 89 p, 14 tab, 27 ref, 4 append. OWRR B-012-SC (5) and S-022-SC (1).

Descriptors: *Economic impact, Input-output analysis, *Community development, Environmental effects, Demand, *Economics, *Environment, *Evaluation, *South Carolina, *Industries, Benefits, Data collections, Quality control, Values, Planning, *Alternative water use.
Identifiers: *Beaufort County (SC), Industrial residuals, *Development alternatives, *Industrial development, Export base theory, Economic development, Economic base, Environmental quality.

An economic base study of Beaufort County, South Carolina, indicated a critical need for economic development to provide additional jobs and tax revenues for the county. A modified input-output model was used to evaluate the economic and environmental repercussions of seven types of economic development in the county. The local demand for environmental quality was also evaluated relative to expressed willingness-to-pay for various types of environmental amenities. A sample survey of Beaufort County households was used to obtain the willingness-to-pay data. On the basis of this analysis, three options for the economic future of the county were identified. (1) It can choose to risk local environmental quality and opt for the development of economic activities. (2) It can choose to do nothing towards developing a new economic base. (3) It can pursue a middle course.
W72-06605

A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND

SCENIC RIVERS, REPORT OF WATER QUALITY SUBPROJECT,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 05G.
W72-06610

POPULATION, AGRICULTURE AND FOOD SUPPLY IN LATIN AMERICA,
Calgary Univ. (Alberta). Dept. of Geography.
For primary bibliographic entry see Field 03F.
W72-06712

NEW PLANNING HORIZONS FOR THE BUREAU OF RECLAMATION,
Bureau of Reclamation, Washington, D.C.
W. D. Fairchild.
Paper, American Society of Civil Engineers, Irrigation and Drainage Division Special Conference, Lincoln, Nebraska, Oct 1971. 15 p, 3 ref.

Descriptors: *Water resources development, *Planning, *Environments, *Ecology, Project planning, Water reuse, Water conservation, Irrigation, Water harvesting, Water pollution, Economics, Resource development, Investigations, Waste water.
Identifiers: *Water appraisal needs, Resources planning and scheduling methods, Waste water use.

In 1970, the President's National Goals Research Staff alerted the nation to the emerging needs for balanced growth. Technological prowess must be applied in harmony with social and environmental goals to achieve this balanced growth. Today's water program is characterized by a polarization of views--the developers on one side and the preservationists on the other. Basic communication between them is the news media and/or the courts. Combining environmental and economical values in a proper balance can result in the good life. To participate in reassessment of water planning, the Bureau of Reclamation has established a special studies program to: (1) prepare guidelines for multiobjective planning, (2) evaluate procedures for enhancing efficiency and capability, (3) examine systems analysis as an improved planning tool, (4) analyze budgets and schedules, and (5) review economic issues and concepts. Data from an inventory being compiled of water normally wasted to the ocean, streams, or lakes will be analyzed to identify opportunities for recycling and reuse, an important method of stretching limited water supplies. Improved procedures are needed for projecting problems, needs, and requirements. (USBR)
W72-06752

PHYSICAL AND FINANCIAL MASTER PLANNING,
Black and Veatch, Kansas City, Mo.
C. W. Keller.
Journal of the American Water Works Association, Vol. 64, p. 71-74, February 1972. 1 photo, 1 tab.

Descriptors: *Long-term planning, *Water works, *Financial feasibility, *Future planning (Projected), *Water supply, Facilities, Administration, Coordination, Estimated benefits, Estimated costs, Political aspects, Water resources development, Utilities, Water rates, Loans, Budgeting, Financing, Government finance, Financial analysis, Equipment, Water demand.

Master planning for water-utility systems establishes objectives for the utility as a whole for a substantial future time period, together with the steps needed for attaining these objectives. Capital improvement and financial planning constitute a major portion of master planning. Planning for capital improvements should cover expected needs for major items as a result of growth or replacement demand in terms of source of supply, transmission, treatment, distribution, storage, customer facilities, administration, and operation. Because the physical plan should cover at least twenty years, it should be flexible enough to take into consideration changing conditions. A financial plan should include estimates of future revenues and expenditures and provide a proposed method of financing the physical plan. One major benefit of financial planning is that it provides a means of measuring the desirability of the proposed physical program. It also provides recognition of future needs, thus allowing both rate modifications and bond elections to be carried out in the most beneficial manner. The development of a master plan requires an extensive effort, usually by a consulting engineer, and acceptance requires a good public relations effort. (Johnson-Florida)
W72-06889

CANADA'S INTERNATIONAL WATERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 06E.
W72-06925

ENVIRONMENTAL PLANNING AND MANAGEMENT,
Drexel Univ., Philadelphia, Pa.
P. W. Purdom.
In: Environmental Health, Academic Press, New York. 1971. p 545-573. 1 fig, 43 ref.

Descriptors: *Environment, *Planning, *Decision making, *Management, *Statistical methods, *Evaluation, Quality control, Conservation, Priorities, Resources, Budgeting.
Identifiers: *Program planning, *Statistical evaluation, Comprehensive planning, Program objectives, Vital statistics, Statistical significance, Standard population.

An overall perspective for the planning and management of the environment is presented. The discussion is divided into considerations of program planning and of statistical evaluation. Elements of program planning include: (1) determination of needs, (2) establishment of priorities, (3) formulation of program objectives, (4) examination of resources available and required, (5) preparation of plan of action, including organization, (6) preparation of budget, and (7) formulation of a system of evaluation. These factors are all interrelated. An important part of the system is sufficient feedback to appropriate points of information subsequently developed with modification as necessary. An understanding of some fundamental principles of statistics is necessary to environmental planning and management. Considerations include: (1) vital statistics, (2) statistical significance, and (3) standard population. Evaluation and solution of environmental problems must consider biological interactions, human stress, land use patterns, and interrelatedness of environmental areas. Political and economic influences can be critical and decisive factors. In the planning of a comprehensive program of environmental management, it is essential to consider all actions which will influence the quality of the environment. Man has the capability to modify his environment, but whether his actions will result in further degradation of provide for an environment which enhances the quality of life will depend on the values used in establishing priorities. (Strachan-Chicago)
W72-06938

COORDINATION OF INDUSTRIAL AIR AND WATER QUALITY PROGRAMS AS AN EFFECTIVE MANAGEMENT POLICY,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 05G.
W72-06942

ENVIRONMENTAL QUALITY AS AN ADMINISTRATIVE PROBLEM,
Indiana Univ., Bloomington.
For primary bibliographic entry see Field 06E.
W72-06943

WATER UTILITIES -- A VICTIM OF SUCCESS,
Washington State Dept. of Social and Health Services, Olympia.
For primary bibliographic entry see Field 05F.
W72-06945

THE OPTIMAL CONTROL OF POLLUTION,
John F. Kennedy School of Government, Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W72-06950

THE ENVIRONMENT: PAST, PRESENT, AND PLUPERFECT,
Johns Hopkins Univ., Baltimore, Md. Dept. of Sanitary Engineering.
A. Wolman.
Journal of the American Water Works Association, Vol. 63, No. 11, p 651-657, October 1971. 3 photo, 11 ref.

Descriptors: *Environment, *Ecology, *Conservation, *Deterioration, *Quality control, Long-term planning, Climates, Thermal power, Air pollution, Water pollution, Benefits.
Identifiers: *Myths, *Environmental degradation, Detrimental affects.

The state of the environment of the past, present, and pluperfect is reviewed. The prophets of 'gloom and doom' maintain that the environment is rapidly being poisoned and that there is no hope for a reversal of present conditions. An attempt is made to dispel certain myths about environmental degradation. (1) In this century the likelihood of direct climate change resulting from CO2 is small, but is long-term consequences are so great, that much more must be learned. (2) Although by the year 2000 global thermal-power will be six times the present level, it is not expected to affect global climate. (3) Atmospheric oxygen is practically constant. (4) The quality of rivers in the US and in England has not been completely degraded over the last 50 years. (5) Lake Erie is not 'dead'. (6) The atmosphere over many cities has greatly improved over the past 26 years. (7) The announcement that the water distributed by water utilities for domestic purposes is unsafe and does not meet federal standards was false. Beneficial and detrimental affects on the environment result directly from man's own behavior. There are innumerable environmental problems, and the tools to solve them are in existence. The future of the environment depends upon man's ability to adjust to change, with the maximum of wisdom and logic. (Strachan-Chicago)
W72-06951

WATER QUALITY MANAGEMENT PLANNING IN SOUTH CAROLINA.
South Carolina State Planning and Grants Div., Columbia.
For primary bibliographic entry see Field 05G.
W72-06953

UNSOLVED ENGINEERING PROBLEMS IN WATER QUALITY MANAGEMENT,
Texas Univ., Austin.
For primary bibliographic entry see Field 05D.
W72-06954

ENVIRONMENTAL PLANNING: 1 - ENVIRONMENTAL INFORMATION FOR POLICY FORMULATION,
For primary bibliographic entry see Field 06G.
W72-06955

ECONOMICS AND MANAGEMENT OF COASTAL ZONE RESOURCES,
George Washington Univ., Washington, D.C.
J. L. Knetsch.

In: Coastal Zone Resource Management, Praeger Publishers, 1971. p 84-94. 4 ref.

Descriptors: *Economics, *Management, *Estuarine environment, *Planning, *Pricing, Environment, Efficiencies, Costs, Benefits, Equitable apportionment, Estuarine environment.
Identifiers: *Coastal zone, *Economic incentive, *Optimum use, Environmental degradation, Coastal resource management, Strategy, Economic forces.

The problem to be faced in connection with maintaining and enhancing the values of the Coastal Zone and of the estuaries are the results of a failure of economic incentives to guide resources to their optimum uses, from the point of view of everyone. The pricing system provides an incentive structure that most directly results in the real plight of environmental degradation. The responses to the situation include a suggestion that the public acquire title to these important resources. Such a suggestion fails to recognize the basic cause of the problem, and as a solution does not guarantee the efficiency of resource use. An alternative approach for dealing with uneconomic degradation of estuarine and coastal values might consist of a means to make the prices that guide resource decisions in these areas reflect the true costs that are incurred by reason of resource alteration or destruction. By utilizing the influence of economic forces rather than attempting to counter them, such a scheme coule be expected to lead to an over-all improvement in the utilization of these resources, increasing efficiency and equity. This proposal could usefully be considered as a major part of a management strategy for dealing with estuarine and coastal resource problems. Such a strategy might include a combination of forbidding certain uses, restricting other environmentally destructive activities, and purchasing still others, but the majority of cases could involve a heavy reliance on this form of economic incentive as a means of dealing with the problem. (See also W72-05927, W72-05928 and W72-06957) (Strachan-Chicago)
W72-06956

A POLICY ANALYSIS APPROACH: OBJECTIVES, ALTERNATIVE DEVELOPMENT STRATEGIES, AND ECONOMETRIC MODELS,
North Carolina Univ., Chapel Hill.
M. M. Hufschmidt, H. Knox, and F. H. Parker.
In: Coastal Zone Resource Management, Praeger Publishers, 1971. p 104-120. 5 ref.

Descriptors: *Planning, *Decision making, *Analysis, *Model studies, *Estuarine environment, North Carolina, Systems analysis, Methodology, Flexibility, Data collections, Resources, *Econometrics.
Identifiers: *Policy analysis, *Policy making, *Objectives, *Alternative development strategies, *Econometric models, Approach, Hypothesis, Dynamic planning, Goals, Coastal zone.

An approach to research on the planning and decision making process for the seashore and estuarine zones of North Carolina is proposed. The material is presented in four parts: (1) a statement of the hypothesis underlying the proposed approach; namely, that modern policy analysis, involving the essential elements of systems analysis, is required for effective public decision making in complex settings, (2) a statement of the research methodology, (3) a statement of the research methodology as it relates to use of econometric models, and (4) a summary statement relating the proposed approach and methodology to planning for Coastal Zones in general and to questions of dynamic planning, flexibility, and needs for data. Policy making for the Coastal Zone and it resources should start with a conscious attempt to define goals for the region. Systems analysis and detailed planning techniques for the region will be effective only if they can proceed from a well-developed set of goals. (See also W72-05927, W72-05928 and W72-06956) (Strachan-Chicago)
W72-06957

CONFLICTS IN WATER RESOURCES PLANNING.
Texas Univ., Austin. Center for Research in Water Resources.

Available from Center for Research in Water Resources, Route 4, Box 189, Austin, Texas 78757, Price-$15.00. Water Resources Symposium No 5, E. F. Gloyna and W. S. Butcher, editors, 1972. 172 p, 47 fig, 7 tab, 125 ref.

Descriptors: *Planning, Water resources development, *Comprehensive planning, *Decision making, Ecology, Governments, Model studies, Water reuse, *Water management (Applied), *Water allocation (Policy), Regional development, Economic justification, Forecasting, Project planning, Future planning (Projected).
Identifiers: *Conflicting interests.

Essays were presented at a conference held at The University of Texas at Austin, November 16-20, 1970. The first section deals with such issues as conservation of resources and the relation of water resources planning to land use policy. The second section deals with the government's role in water resources planning at the federal, state and local levels. Ecology as a planning parameter is the subject of section 3. (See also W72-06958 thru W72-06971)
W72-06958

A SEARCH FOR GOALS IN WATER RESOURCES PLANNING,
National Water Commission, Arlington, Va.
C. F. Luce.
In: Conflicts in Water Resources Planning, (Water Resources Symposium No. 5), Center for Research in Water Resources, Texas Univ., Austin, 1972. p 7-13, 5 ref.

Descriptors: *Planning, *Priorities, *Water resources development, Water policy, Programs, Institutions, Formulation.
Identifiers: *Policy making, *National Water Commission, *National goals, *National objectives, Conflicts, Implementation.

The goals of the National Water Commission are discussed. A primary objective of the Commission has been to seek ways in which the people's water policies and programs can be brought into full harmony with the nation's goals. The following conclusions are made: (1) that the nation's water policies and programs should be brought into line with the national goals, (2) that the ideals upon which our democratic system is based constitute the 'fixed stars' by which a safe course is set for the nation, (3) that there are serious conflicts among the second-order, or specific, national goals which underlie the programs by which the nation utilizes, develops, and conserves its water resources, (4) that many of the water problems of today and the future are the result of these conflicts, (5) that there is a need for a consistent system of national goals, and (6) that there is a need for the development of institutions capable of guiding the nation in the formulation of a system of goals, and for the implementation of these goals. (See also W72-06958) (Strachan-Chicago)
W72-06959

THE ROLE OF WATER IN RESOURCES DEVELOPMENT,
Nevada Univ., Reno. Center for Water Resources Research.
G. B. Maxey.
In: Conflicts in Water Resources Planning, (Water Resources Symposium No. 5), Center for Research in Water Resources, Texas Univ., Austin, 1972. p 14-17. 1 tab, 2 ref.

Descriptors: *Water resources development, *Evaluation, *Planning, Agriculture, Estimation, Water supply, Control, Water utilization, Forecasting.
Identifiers: Water resource parameters.

Evaluation of the role of water in future resource development is dependent upon data and knowledge which are not accurate, or indeed, are not even available at present. Increases in water use and the necessity of planning for them will not be excessive in the foreseeable future, most notably in agriculture and in energy generation, both thermal and nuclear. Agriculture is the largest user of water. Water used in agriculture produces the least dollar value of any water use. It is obvious that water shortage or water unavailability will prove most trying in the agricultural area. It is in this area that control of the water resource parameter can be and probably will be used as a control on other parameters such as population dissemination, location and dissemination of industry, and land use. Relative to agriculture, mineral industries need smaller quantities of water, and relatively high costs can be afforded for water. The outlook for domestic and municipal water is an increase in withdrawals. Large increases in withdrawal are expected for steam electric power. Overall predictions suggest that the nation's water supply will be adequate for all demands except agricultural in the next 30 years. More efficient planning, management, and development is needed in many local areas to develop and distribute the supply optimally. There is increasing opinion that the water parameter may be used as a control on local, regional, and even national development, including resource development. It seems possible that planning efforts by the states, the regions, and the nation will result in some use of the water parameter as a control. (See also W72-06958) (Strachan-Chicago)
W72-06960

ELECTRIC POWER GENERATION AND ITS IMPACT ON WATER RESOURCE PLANNING IN TEXAS,
Texas Electric Service Co., Fort Worth.
H. R. Drew.
In: Conflicts in Water Resources Planning, (Water Resources Symposium No. 5), Center for Research in Water Resources, Texas Univ., Austin, 1972. p 18-29. 3 fig, 13 ref.

Descriptors: *Electric power, *Electric power demand, *Water resources development, *Planning, *Texas, Water supply, Future planning (Projected), Long-term planning, Quality control.
Identifiers: *Electric power generation, Energy use, Energy supply, Standard of living.

The progress of mankind is related to its use of energy. There is a correlation between the standard of living of the various nations and their per capita use of energy. The material well-being of U.S. citizens and the quality of their life are inextricably bound to the energy supply, and the use of energy in the form of electricity. Possibilities of hydroelectric power, generation of power with fossil fuels, and nuclear power are considered in terms of future supplies of energy. In Texas, there have been few conflicts over the acquisition of water supplies for thermal power generation. A study of projected water use for power generation on a per capita basis indicates that while per capita power consumption will increase in the future, the efficiency of the power systems will also increase, resulting in only a modest increase in the per capita use of water for power generation. The complementary nature of many developments of joint water supplies for power plant cooling and municipal uses has resulted in the lack of conflict. The calefaction of Texas reservoirs and thermal limits are discussed in this context. Long-range considerations include (1) cooling water supply, (2) water desalination, and (3) nuclear fusion power. (See also W72-06958) (Strachan-Chicago)
W72-06961

PUBLIC INTEREST IN THE LOCATION OF PUBLIC FACILITIES,
Chicago Univ., Ill. Center for Urban Studies.
J. R. Sheaffer.

In: Conflicts in Water Resources Planning, (Water Resources Symposium No. 5), Center for Research in Water Resources, Texas Univ., Austin, 1972. p 30-40. 7 fig.

Descriptors: *Facilities, *Waste disposal, *Planning, *Environment, Management, Pollutants.
Identifiers: *Total management system, Public, Economic return, Conceptual framework.

The public officials who have been accustomed to locating public facilities without consideration of the general public are finding that the public is fast intruding into the planning process. There are three environmental principles which can provide a conceptual framework for planning and development. (1) The environment is a single system with air, water, and land interacting and affecting and being affected by human occupancy. (2) The environment system, for planning purposes, is closed. (3) Pollutants are potential resources out of place. Three case examples of land solutions to waste disposal problems are discussed: (1) The 'Thumb Express' or sludge train, which uses the unit train concept to link urban and agricultural areas, (2) The Muskegon County Wastewater Management Plan, which recognizes wastewater as a resource out of place and seeks to use it productively, and (3) 'Mount Trashmore', an above ground sanitary landfill, which illustrates that solid wastes can be disposed of in a beneficial manner without causing other environmental problems. If one were to combine aspects of the three case examples discussed at a particular location, it would be possible to achieve a total management system for many urban wastes. Adoption of a total management approach to waste disposal would permit the development of a single land area to accommodate sewage effluent, sewage sludge, solid wastes, and heat, at the same time providing a site for a nuclear power plant. Such a waste management system would provide some economic return in the fertilizing value of the nutrients, the stimulating effects of the heat, and the influence of irrigation on crops. (See also W72-06958) (Strachan-Chicago)
W72-06962

THE EFFICACY OF A COORDINATED PLAN: THE TEXAS PLANNING MODEL,
Texas Tech Univ., Lubbock.
H. W. Grubb.
In: Conflicts in Water Resources Planning, (Water Resources Symposium No. 5), Center for Research in Water Resources, Texas Univ., Austin, 1972. p 43-55. 8 ref.

Descriptors: *Planning, *Coordination, *Mathematical models, *Input-output analysis, *Economics, *Texas, Analysis.
Identifiers: *Texas input-output project, Policy making.

The primary objective of the Texas Input-Output Project is to produce mathematical economic models of regional economies within Texas. Particular attention has been given to insure that the resulting models will be tools capable of analyzing and explaining important economic consequences of alternative public sector projects and programs, including industrial development, water resources investments, investments in public facilities, spending for public services and public welfare, and taxation. The input-output models describe regional economies in quantitative terms and systematically relate each producing sector simultaneously to markets for products and to supplies of material and service inputs. The models provide a method which permits better understanding of the direct and indirect output and input requirements to meet the economy's final demands for planners and policymakers. Use of the same input-output models will introduce consistency and comparability into the planning process. The input-output models should also serve as a common source of information about the economy and would be able to coordinate many of the planning programs in the state of Texas. (See also W72-06958) (Strachan-Chicago)
W72-06963

THE URGENCY OF STANDARDIZED GOVERNMENTAL POLICY FOR WATER RESOURCE DEVELOPMENT,
Texas State House of Representatives, Austin.
B. Clayton.
In: Conflicts in Water Resources Planning, (Water Resources Symposium No. 5), Center for Research on Water Resources, Texas Univ., Austin, 1972. p 56-61. 11 ref.

Descriptors: *Water resources development, *Governments, *Planning, Coordination, Flexibility, Priorities, Water supply, Financing, Evaluation, Population, Organizations.
Identifiers: *Policy making, *Standardized governmental policy, Interdisciplinary inputs, National goals, Energy resources.

To meet the pressing needs of the rising population and the growing economy, an expanded and accelerated program of comprehensive water resource development is demanded. Recurrent droughts and devastating floods are ample evidence of the inadequacy of present efforts and the need for a greater commitment of national and state action for an enlightened water resource development program. Efforts on the state and local government level are not providing ample water supplies. On the Federal level, less than one percent of the national budget goes for water resource development. Water resource problems include: financing project cost, evaluation procedures, providing food and fiber for the world population, creating a healthy industrial climate to provide jobs, producing energy resources such as gas and oil, overcoming emotionalism and the preservationist attitude, unnecessary governmental delays, side effects of agency reorganization and bureaucracy, and irresponsibility at all levels. Papers have been published which indicate that there is duplication in many areas. There is a need for better coordinated efforts in water resource development and the planning of land use patterns. Projects can be designed with enough flexibility to provide interdisciplinary inputs as the project itself is constructed. National goals and priorities must be achieved, and governmental programs must be standardized. (See also W72-06958) (Strachan-Chicago)
W72-06964

POLICY TOWARD FLOOD PLAIN MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
D. J. Allee.
In: Conflicts in Water Resources Planning, (Water Resources Symposium No. 5), Center for Research on Water Resources, Texas Univ., Austin, 1972. p 62-76. 12 ref.

Descriptors: *Water resources development, *Flood control, *Planning, *Decision making, *Cost sharing, Environment, Economics, Coordination, Management.
Identifiers: *Flood plain management, *Water resources planning, *Conflicts, Strategies, Coalitions, Flood characteristics, Flood-susceptible activities, Flood loss.

There have been many conflicts in water resources planning over flood control. Conflict is overrepresentation in the planning process and the resulting weighting of the interests involved. Conflict is costly, diverting energy and political resources from other concerns. Conflict or the threat of conflict causes new interests to be represented in the decision making process. Conflict can lead to innovations and new technology. New mixed strategies are needed to forge broader coalitions behind flood control work. There are three categories in managing the flood plain: (1) to change the characteristics of the flood, (2) to change the distribution of flood-susceptible activities, and (3) to change the burden of the losses from flooding. A recent study (Marshall, 1970) explored the economic logic behind the consequences of local bargaining power in water development projects. Future reviews of cost-sharing changes should be based upon further exploration of the requirements of mixed strategies. This offers program expansion possibilities to the agencies in exchange for the reduced emphasis on structures. Such cost-sharing changes should be linked to broadened program responsibilities that link flood control to other environmental objectives and concerns. (See also W72-06958) (Strachan-Chicago)
W72-06965

WATER RESOURCES INVESTMENT AS NATIONAL GOAL AND ECONOMIC INCENTIVES FOR POLLUTION CONTROL,
D. C. Department of the Interior, Washington.
J. J. Flannery.
In: Conflicts in Water Resources Planning, (Water Resources Symposium No. 5), Center for Research on Water Resources, Texas Univ., Austin, 1972. p 77-91. 4 ref.

Descriptors: *Investment, *Water resources development, *Water pollution control, *Planning, *Evolution, *Standards, Waste disposal, Costs, Prices, Damages, Management, Administration, Economics.
Identifiers: *Water resources investment, *National goal, *Economic incentive, *Effluent charge, Penalty, Inducement, Revenue.

A commentary is presented on the planning and evaluation process, with observations on the significance and implications of some of its features. Suggestions are made relative to incentive for the attainment of the water quality standards as part of the investment goal idea. It is also suggested that a particular level of water resources investment should be established periodically as a national goal. The concept of the effluent charge is discussed. This idea has met with much hostility and has been called a 'permit to pollute'. The idea of an effluent charge has much merit and usefulness as a form of incentive used in conjunction with the legal standards system. Administered prices or effluent charges could be used only to supplement the water quality standards. There are three ways that might be feasible. (1) For a penalty effect in all enforcement cases - charges in these cases would be relatively high against all offenders. (2) For an inducement effect - the charges could be relatively moderate on each waste disposer until compliance with standards was reached. (3) For a revenue effect - the charges could be applied to all waste disposers on a continuing basis even after full compliance with standards. Such a solution would not need justification of the prices as reflective of damages or costs caused by pollution. The prices under the first two ways would be set to induce the meeting of the water quality standards more quickly. The third way would prescribe prices designed to collect the costs of the information and management system from those most responsible for its necessity. (See also W72-06958) (Strachan-Chicago)
W72-06966

WATER RESOURCES, OPTIMIZATION, AND SOCIAL CHANGE,
Office of Science and Technology, Washington, D.C.
W. S. Butcher.
In: Conflicts in Water Resources Planning, (Water Resources Symposium No. 5), Center for Research on Water Resources, Texas Univ., Austin, 1972. p 92-99. 8 ref.

Descriptors: *Water resources development, *Optimization, *Social change, *Systems analysis, *Planning, Project planning, Water resources development, Costs, Benefits, Multiple purpose, Appraisals, Decision making.

Identifiers: *Optimal project, Project evaluation, Alternatives, Systematic approach.

As a social activity, water resources development expresses current attitudes and values. Water resources planning will soon be dealing with four accounts, each with its set of costs and benefits from the point of view of national income, regional development, well-being, and the environment. The field of water resources has a long history of wrestling with the notion of project evaluation. The use of multiple objectives is being prescribed for federal water resources planning. In this context, an optimum plan can only be selected if each of the objectives can be expressed in commensurate terms and if weights can be assigned to the relative importance of each in the multiple objectives. If this were possible, then the multiple objectives could be coalesced into a single one. Use of the single objective would lead to an unequivocal selection process, and therefore, the optimal project from among all the available alternatives. In fact, such a situation is not possible. A choice must be made between all possible alternatives. The only recourse is to use more realistic appraisals of alternative courses of action, so as to make explicitly the trade-offs between the various alternatives with regard to project objectives. Such focusing on alternatives is a direct outgrowth of the development of systems analysis. The distinctive characteristic of systems analysis is its focus on the objectives being sought and the alternative ways that might be used to achieve those objectives. A systematic approach in virtually all planning is necessary to improve the decision making process in a complex world. (See also W72-06958) (Strachan-Chicago)
W72-06967

COMPROMISES BETWEEN WILDERNESS PRESERVATIONS AND WATER RESOURCE DEVELOPMENT,
Texas Univ., Austin.
W. F. Blair.
In: Conflicts in Water Resources Planning, (Water Resources Symposium, No. 5), Center for Research on Water Resources, Texas Univ., Austin, 1972. p 103-106.

Descriptors: *Water resources development, *Technology, *Environment, *Planning, Population, Maintenance, Management, Balance of nature, Priorities, *Ecosystems.
Identifiers: *Wilderness preservations, *Environmental management, Ecological diversity, Life-support system, Manipulation, Ecological balances, Biological control, Goal definition.

The technological capability to modify hydrosphere-lithospere relations is available. The time is past due to interlace technological planning with concerns about the future of the environment and environmental quality. It is necessary to preserve samples of this planet's ecological diversity. There are three compelling reasons for this. (1) Present day man owes it to future generations to preserve samples of the ecological diversity that evolved before man became the dominant influence in world environments. (2) The preservation of natural areas provides baselines with which to judge man's activities in the biosphere. (3) Natural areas need to be retained as 'gene banks'. Certain questions must be asked. (1) How many people can the earth support and at what level of environmental quality. (2) How does environmental planning relate to populational goals. (3) Can a balance be achieved between development and the maintenance of natural environments that will assure a life-support system for future generations. It is possible to see man's future as one of increased environmental management, manipulation of genotypes, and manipulation of interspecies interactions in efforts to restore ecological balances. Biological control is becoming an important tool in the field of environmental management. Definition of goals must be in a broader context than in the past. With broader goals, priorities with respect to environmental trade-off will become easier to determine. (See also W72-06958) (Strachan-Chicago)
W72-06968

WATER QUALITY FOR PRESERVATION OF ESTUARINE ECOLOGY,
North Carolina State Univ., Raleigh.
B. J. Copeland, H. T. Odum, and D. C. Cooper.
In: Conflicts in Water Resources Planning, (Water Resources Symposium, No. 5), Center for Research on Water Resources, Texas Univ., Austin, 1972. p 107-126. 11 fig, 20 ref.

Descriptors: *Estuarine environment, *Ecology, *Preservation, Fresh water, Flow, Salinity, Productivity, Nutrients, Photosynthesis, Respiration, Control, Input-output analysis, *Water utilization.
Identifiers: *Water quantity, Fresh water input, Species diversity, Energy.

Water usage has become an ecological, engineering, legal, and economic problem. One aspect of this problem is the water quantity necessary for the preservation of the ecology of estuaries. Estuaries are important in many ways: (1) most valuable commercial and sport fishes and invertebrates use estuaries during some stage of their development, (2) estuaries are the greatest producing areas accessible to man for available protein, and (3) these waters are used for recreation and industry. From a discussion of various experiments involving estuarine ecology, the following conclusions are made: (1) The combination of freshwater and estuaries dictates the ecological system's development in response to variations of the inputs. (2) Salinity is an important dominant factor in many estuarine system types, and the magnitude of freshwater input controls the salinity regime. (3) The main source of important nutrient materials for estuarine systems is the flow of water from the land. (4) Productivity in estuarine systems is dependent upon the allochthonous organic matter brought into the system via freshwater input. (5) Both photosynthesis and respiration of the estuarine system are dependent upon inflowing materials from freshwater streams. (6) Species diversity decreased in the upper portions of the laboratory microecosystems when drought conditions were imposed. (7) Energy flow diagrams revealed that energy availability and cycling in the estuarine system are drastically reduced when the energy inputs provided by freshwater inputs were reduced. (See also W72-06958) (Strachan-Chicago)
W72-06969

WATER QUALITY FOR ESTUARINE ECOLOGICAL STABILITY,
Texas Univ., Austin.
E. G. Fruh, N. E. Armstrong, and B. J. Copeland.
In: Conflicts in Water Resources Planning, (Water Resources Symposium, No. 5), Center for Research on Water Resources, Texas Univ., Austin, 1972. p 127-146. 4 tab, 13 fig, 28 ref.

Descriptors: *Water quality, *Estuarine environment, *Ecology, *Stability, Maintenance, Ecosystem, Assessments, Correlation analysis, Input-output analysis, Evaluation, Water pollution control, *Water utilization.
Identifiers: *Biological components, Species diversity, Diversity index, *San Francisco Bay, *Galveston Bay, Input flows.

The beneficial category of water uses includes water supply, recreation, and aesthetics. Such beneficial uses are dependent to a degree upon the biological components of the water. To preserve and protect the biological components of a water body means the maintenance of its 'ecological stability'. It has been shown that the stability of an ecological system is related to its species diversity (Odum and Copeland - 1969). The lower the diversity index, the less stable the ecosystem. The relationship between the water quality and diversity index is emphasized. Two estuaries, San Francisco Bay and Galveston Bay, are used as examples. The diversity index is useful in assessing a quantitative expression for the community organization, which in turn yields information concerning the ecosystem's reaction to stress. Thus an 'acceptable' system can be defined tentatively based on the diversity index. Other measures of the 'ecological health' of a system, such as photosynthesis-to-respiration, are also needed for more precise definitions. Correlations can be developed between water quality and diversity index. The water quality in the system then can be related to the water quality of the input flows. In this way, a quantitative evaluation of the improvement in the 'ecological health' of a system by improved water pollution control can be made. (See also W72-06958) (Strachan-Chicago)
W72-06970

MODEL RIVERS, AN AID IN DECISION-MAKING,
Texas Univ., Austin.
E. F. Gloyna, and T. S. Padden.
In: Conflicts in Water Resources Planning, (Water Resources Symposium No. 5), Center for Research on Water Resources, Texas Univ., Austin, 1972. p 147-168. 16 fig, 2 tab, 14 ref.

Descriptors: *Rivers, *Decision making, *Planning, *Model studies, *Ecosystems, Mathematical models, Flumes, Oxygen, Stress, Stress analysis, Simulation analysis, Forecasting.
Identifiers: *River models, *Stream ecosystems, Transport, Radionuclides, Oxygen balance, Stream analysis.

A river model has been used as a tool for qualitative and quantitative study of stream ecosystems and their behavior under stress. This river model is an example of a model studies approach to gathering information about ecosystem behavior from which decision guidelines ultimately can be developed. A model which simulates natural processes and responds to stress can be very helpful. By measuring the magnitude of responses of the model aquatic system to organic and inorganic stress, predictive mathematical models may be developed for real rivers. Conversely, conclusions and hypotheses developed from observations on real rivers can readily be tested under environmental conditions in the model system. A river environment was simulated through the use of aquaria, a reservoir having a capacity of 66,800 cubic feet, and a hydraulic flume. The research flume has been used for two categories of study: (1) the study of transport of radionuclides through an ecosystem, and (2) study of conventional processes in effect in river systems which contribute to oxygen balance, including: (a) an investigation into the effect of hydrodynamic conditions in the model river on reoxygenation through surface diffusion; (b) an investigation of oxygen draw-down resulting from bottom sediment; (c) a study of the role of phytoplankton in the production and consumption of oxygen and its influence in atmospheric reaeration determinations; and (4) a combination of the elements of a,b, c, above into a simulated stream ecosystem, and the stressing of that ecosystem with an organic load to determine whether the oxygen profile follows the predictive formulation presently used in stream analysis. (See also W72-06958) (Strachan-Chicago)
W72-06971

SYSTEMS ANALYSIS IN WATER RESOURCES PLANNING.
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06A.
W72-06984

CHARACTERISTICS OF WATER RESOURCE SYSTEMS AND IMPLICATIONS FOR SYSTEMS ANALYSIS PLANNING.
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06A.
W72-06986

INTEGRATED DEVELOPMENT OF THE ORANGE-VAAL AND TUGELA BASINS,
Rand Water Board, Johannesburg (South Africa).
For primary bibliographic entry see Field 06D.
W72-07042

THE ARKANSAS RIVER BASIN DEVELOPMENT,
Huddersfield Polytechnic (England).
J. E. Wrathall.
Geography, Vol. 56, No. 253, p. 333-335, November 1971. 1 fig.

Descriptors: *River basin development, *Oklahoma, *Regional analysis, *Mining.
Identifiers: *Arkansas River.

The Arkansas River is the third longest river in the U.S. The new river basin development nearing completion provides for flood and sedimentation control, bank stabilization, hydroelectric power production, pollution abatement, provision for domestic and industrial use, the development of recreational facilities and the extension of the inland waterway system of the U.S. into hitherto landlocked Oklahoma. Engineering facets and freight traffic projections are described in detail. Wheat growers and miners will be beneficiaries of the project. The new water-compelled freight rates will facilitate the exploitation of many mineral deposits which were formerly uneconomic because of freight rates. The full effects of the project will change the face of the whole region, both economically and environmentally. (Casey-Arizona)
W72-07060

COMPETITION FOR WETLANDS IN THE MIDWEST. AN ECONOMIC ANALYSIS,
Social Security Administration, Baltimore, Md. Office of Research and Statistics.
For primary bibliographic entry see Field 04A.
W72-07111

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A NOTE ON CRITERION FOR SELECTION OF IRRIGATION PROJECTS,
For primary bibliographic entry see Field 03F.
W72-06581

UNIT AND TOTAL COST FUNCTIONS FOR WATER TREATMENT BASED ON KOENIG'S DATA,
Illinois Univ., Urbana. Dept. of Business Administration.
H. Hinomoto.
Water Resources Research, Vol 7, No 5, p 1064-1069, October, 1971. 1 fig, 3 tab, 4 ref.

Descriptors: *Water treatment, *Total costs, *Unit costs, *Regression analysis, Operating costs, Fixed costs, Use rates, Data collections.
Identifiers: *Water treatment plants.

When an optimum capacity for a new water treatment plant is determined, essential information includes fixed and variable operating costs and the amortization of initial capital investment in the plant. Consequently, a formula is developed to estimate the total cost of surface water treatment incurred by the plant of a given capacity operated at a given use rate. Assuming that the possible range of capacity for practical purposes is limited to the region reflecting economies of scale, a concave relationship between capacity and capital cost or daily cost of any factor of water treatment at capacity is generated. That is, capital cost or daily factor cost is a nonlinear function of the design capacity. However, the relationship is linear in logs, so the parameters of the cost function are estimable by simple linear regression. Unit cost functions are estimated for capital investment, chemicals, pumping energy, heating energy, manpower, maintenance and repair, and miscellaneous costs. With the exception of manpower, the costs of each factor estimated are very close to those reported by the Koenig study. The total cost per unit of water production and the total daily cost are obtained by summing the individual cost functions. (Settle-Wisconsin).
W72-06584

COSTS OF TREATING TEXTILE WASTES IN INDUSTRIAL AND MUNICIPAL TREATMENT PLANTS: SIX CASE STUDIES,
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 05D.
W72-06601

EFFLUENT FEES IN WATER QUALITY MANAGEMENT: THE VERMONT WATER POLLUTION CONTROL ACT,
For primary bibliographic entry see Field 05G.
W72-06873

EFFLUENT TAXES AND REGULATION.
For primary bibliographic entry see Field 05G.
W72-06884

PHYSICAL AND FINANCIAL MASTER PLANNING,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 06B.
W72-06889

TWO METHODS OF STUDYING THE EFFECT OF MUNICIPAL SEWER SURCHARGES ON FOOD PROCESSING WASTES,
North Carolina State Univ., Raleigh. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W72-06976

REGIONALISM - SENSE AND SAVINGS,
Central Connecticut State Coll., New Britain. Dept. of Economics; and State Univ., of New York, Albany.
J. C. Loughlin, and E. F. Renshaw.
Water and Wastes Engineering, Vol. 9, No. 1, p 36-38, January, 1972. 1 tab, 15 ref.

Descriptors: *Water resources development, *Management, *Regional analysis, *Financing, Taxes, Economic efficiency.
Identifiers: *User charges.

Analysis of changing priorities and a number of findings suggest that substantial economies might be achieved by organizing and financing water resource development on a regional basis. Much of the growth in federal tax revenues will be needed to support other worthwhile purposes, so any substantial improvement in environmental quality will require a more efficient use of existing resources and an alternative source of funds that places greater reliance on user charges and long-term borrowing to finance construction outlays. There are several advantages associated with regional management and financing of water development projects: (1) the cost of obtaining a specified level of water quality could be reduced by about one-half under a regional management program; (2) regional agencies would be in a better position to take advantage of such factors as low flow augmentation, mechanical reaeration, and dredging of estuaries to reduce benthal oxygen demand; (3) regional management of water supply can also significantly reduce the total cost of municipal water. For regional agencies to have the optimum organizational structure, they need the power to levy user charges to finance operating expenses and a portion of the capital cost of new facilities. (Settle-Wisconsin)
W72-07115

SOCIAL PURPOSE TAXATION, A POLICY PROPOSAL.
Detroit City Plan Commission, Mich.
For primary bibliographic entry see Field 05G.
W72-07119

6D. Water Demand

WATER USE IN THE GREAT LAKES BASIN,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
Terence R. Lee.
Map available for $1.00 from CCIW, Surveys and Mapping Branch, OTTAWA, Ontario, K1A OE9.
Canadian Geographical Journal, vol 82, no 1, p 200-205, June 1971.

Descriptors: *Water utilization, *Recreation, *Domestic water, Water quality, *Industrial water, Great Lakes, *Water demand, Water allocation (Policy), Lakes.

The distribution of the uses of Great Lakes water, as detailed on a map appended to the journal, is an important consideration in their management. Municipal supply and recreation use of the Great Lakes are growing rapidly and conflict with waste disposal, commercial navigation and commercial fishing. Residential use of water takes a major share of that withdrawn by municipal water utilities. Large industries usually have their own intakes for water, used primarily for cooling, and return it to the lakes 10 deg to 15 deg warmer. Beneficial uses for this waste heat may be found. Man's relationship with the water resource becomes most intensive at the shoreline where conflicts between recreation and industrialization will increase. The root of the water management problem is people, their employment and their distribution. (Fosdick-CCIW)
W72-06679

ECONOMICS OF A WATER-YIELD FUNCTION FOR SUGAR CANE,
Economic Research Service, Honolulu, Hawaii. Natural Resource Economic Div.
For primary bibliographic entry see Field 03F.
W72-06832

WATER REQUIREMENTS OR WATER DEMANDS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
S. H. Hanke, and J. J. Boland.
Journal of the American Water Works Association, Vol. 63, No. 11, p 677-681, November 1971. 3 tab, 3 fig, 20 ref.

Descriptors: *Water requirements, *Water demand, *Water supply, *Pricing, *Costs, Domestic water, Sprinkling, Water users, Forecasting, Planning, *Water utilization, Colorado, *Water quality.
Identifiers: *Boulder (Colo), Functional relationship.

An empirical study of water use in Boulder, Colorado is used to illustrate the effect of a change in water price on the quantity demanded. The purposes are (1) to demonstrate that a negative functional relationship exists between the quantity of water demanded and the price paid for each unit; and (2) to demonstrate that pricing policy is a powerful tool that can be used by water-utility managers to satisfy a variety of goals of the utility. Analysis of both domestic and sprinkling water use for all meter routes gave the same results of a large, consistent drop in water use immediately following the adoption of a metered rate. Personal interviews with individuals residing within the study area during the price changes revealed that a high percentage consciously altered their water-use habits in response to the price increase. This study did not support the contention that demand will return to former levels after the controversy

surrounding meter installations subsides. On the contrary, the study showed that an increase in relative price will be followed by a drop in the quantity demanded, and that the longer the price change persists, the greater will be the change in demand. Results were consistent with those reported for aggregate municipal demands under similar conditions. Other sectors of demand were observed to behave in a similar manner with respect to price. The major implication of these results is that forecasting techniques must take explicit account of the effect of price on demand.
W72-06952

INTEGRATED DEVELOPMENT OF THE ORANGE-VAAL AND TUGELA BASINS,
Rand Water Board, Johannesburg (South Africa).
D. Stephenson.
South African Journal of Science, Vol 67, No 9, p 457-463, September 1971. 1 fig, 2 tab, 4 ref.

Descriptors: *River basins, *Water allocation (Policy), *Water resources development, *Planning, *Cost-benefit analysis, Water utilization, Water users, Water distribution (Applied), Mine water, Municipal water, Industrial water, Irrigation water, Irrigation practices, Inter-basin transfers.
Identifiers: *South Africa, *Vaal River, *Orange River, *Tugela River.

The largest economic complex of South Africa lies in the Vaal basin and is strongly dependent on the water of the Vaal River. A number of the nation's major rivers arise in the vicinity of this major economic region. In supply-demand terms, the Vaal river has a mean flow of 2 billion gallons/day and present demand is less than 50% of that. The Orange River mean flow is 3.7 billion gallons/day with a demand less than 10%, while the Tugela river by contrast to the other 2 rivers, has practically no demand on its mean 2.6 billion gallon/day flow. Also, the Tugela is practically undeveloped in terms of storage capacity. Projections are made of probable irrigation, industrial, mining and municipal demands through the year 2000. They indicate that practically all the available water of the Vaal and Orange Rivers will be committed and that intensive allocation planning is imperative. Under the assumption that planning for optimum utilization of water resources requires identification of direct and indirect benefits and consideration of reliability of supply, an optimum distribution scheme was put together and diagrammed. This scheme involves interbasin transfers, water reuse and less irrigation water for arid regions where water use efficiency is so low. The distribution pattern is essentially contripetal as opposed to natural flow patterns which are centrifugal, or from the heart outwards toward the oceans. (Casey-Arizona)
W72-07042

WATER RESOURCES IN THE UKRAINIAN S.S.R., PRESENT AND FUTURE,
Ukrainian National Committee for the International Hydrological Decade, Kiev (USSR).
S. M. Perekhrest.
Nature and Resources, Vol 7, No 3, p 9-14, 1971. 1 fig, 4 tab.

Descriptors: *Water resources, *Regional analysis, *Water resources development, *Drainage systems, Foreign lands, River basins, River flow, Groundwater basins, Dams, Geographical regions, Drainage programs, Reclamation, Water balance, Water pollution, Reservoirs, Irrigation systems, Irrigation canals.
Identifiers: *Ukraine, S.S.R.

Most of the Ukrainian S.S.R. is a plain; in the north it is wooded and very marshy, the central part is mainly forested steppe while the south is steppe. The major river of the republic is the Dnieper, which is the third longest river of Europe. Water resources are very unevenly distributed in both time and space. The regions with the least volume of natural waters are the regions of highest agricultural production and hence the regions of greatest water consumption. Also, when demand is highest during the crop-growing season, river flow is at its lowest. As a means of partial control of spring floods and of using the surplus in the dry summer months, over 22,000 ponds and 250 reservoirs have been built by the Soviet regime including 5 large reservoirs on the Dnieper. Complex canal systems have been built, both to drain large areas of swamp and marshland and to deliver irrigation water to dry crop regions. There are 2 main categories of ground water: upper aquifers fed mainly by rainfall in the catchment area and deep (100-300m) aquifers fed from outside the catchment area. There are about 90,000 wells and 45,000 boreholes in the Ukraine. These great water resources have been improved by drainage from wet areas and exploited for hydroelectric power, irrigation and industry. Many of the projects are described. (Casey-Arizona)
W72-07056

COMPETITION FOR WETLANDS IN THE MID-WEST. AN ECONOMIC ANALYSIS,
Social Security Administration, Baltimore, Md. Office of Research and Statistics.
For primary bibliographic entry see Field 04A.
W72-07111

6E. Water Law and Institutions

A CASE STUDY IN THE FORMULATION OF A WATER RESOURCES MANAGEMENT PLAN,
Mississippi State Univ., State College. Water Resources Research Inst.
Milburn Gardner, III, and Guy T. Peden, Jr.
Available from the National Technical Information Service as PB-208 033, $3.00 in paper copy, $0.95 in microfiche. Mississippi Water Resources Research Institute Completion Report, 1972, 210 p, 17 tab, 36 ref, 5 append. OWRR B-006-MISS (1).

Descriptors: *Water management (Applied), *Planning, *Project planning, *Administration, *Mississippi, *Personnel, *Water districts, *Inland waterways, Information exchange.
Identifiers: *Pat Harrison Waterway District (Miss), *Subsystem, *Administrative subsystems, Information subsystems.

A plan for administering water resource projects which can be implemented by the Pat Harrison Waterway District is delineated. The proposed administrative management plan is presented in terms of activities concerning subsystems within the organization. The Authority Administrative, Operational and Functional Administrative and Project Administrative Subsystems are utilized in designing the plan. The Authority Administrative Subsystem is comprised solely of the Board of Directors which holds the ultimate responsibility for accomplishment of the objectives of the District. The Operational and Functional Subsystems describe the overlapping of specific personnel. The Project Administrative Subsystem describes those personnel within Engineering and Operations whose major assignments may be characterized as the management of specific physical facilities. Finally, an information flow chart shows the information flows between the subsystems above.
W72-06607

INTERSTATE GROUND-WATER AQUIFERS OF THE STATE OF WASHINGTON (PHYSICAL AND LEGAL PROBLEMS--A PRELIMINARY ASSESSMENT),
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 04B.
W72-06608

COMPILATION AND SUMMARIZATION OF THE MASSACHUSETTS GENERAL LAWS, SPECIAL LAWS, PERTINENT COURT DECISIONS, ETC. RELATING TO WATER AND WATER RIGHTS.
Massachusetts Water Resources Commission, Boston. Div. of Water Resources.

1970. 296 P.

Descriptors: *Water rights, *Legal aspects, *Water law, *Interstate compacts, *Massachusetts, Governments, Administrative agencies, Water management (Administrative), Legislation, Public rights, Federal government, Judicial decisions, Public health, Water policy, Watercourses (Legal).
Identifiers: Special acts.

The early development of the common law of water rights is outlined, with respect to the sea, navigable waters, submerged land, ponds, and other aspects of water rights. Case law and early British statutory materials are included. The laws of Massachusetts, including pollution statutes, are set forth. Constitutional provisions of the United States and Massachusetts relating to water rights are discussed. The present statutory scheme relating to water law is detailed. This includes governmental organization, administrative responsibility, public health, recreation, fish and wildlife, structures, and actions and crimes. Seven interstate compacts involving Massachusetts are listed, as are flood control and watershed projects. A chronological list of special acts relating to specific areas in Massachusetts is provided. The regulations of various Massachusetts agencies are detailed. A list of all great ponds and rights-of-way to such ponds is set forth. A selected bibliography, a table of cases and an index are included. (Grant-Florida)
W72-06632

WATER POLLUTION CONTROL LEGISLATION, AGRICULTURAL RUNOFF, PART 6.
Congress, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-06633

WATER POLLUTION CONTROL LEGISLATION, OCEAN DUMPING, PART 5.
Congress, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-06634

OIL RECYCLING,
Congress, Washington, D.C.; and House, Washington, D.C.
C. A. Vanik.
Congressional Record, Vol. 117, No. 186, Part II, E 12927-12929 (daily ed.) December 2, 1971. 2 tab.

Descriptors: *Oil wastes, *Water pollution sources, *Path of pollutants, Oil, Chemical wastes, Groundwater, Sewage effluents, Sewage treatment, Sewage bacteria, Pollutant identification, Environmental sanitation, Air pollution, Taxes, Oil industry, Industrial wastes, Marine plants, Marine animals, Legislation, Federal government.
Identifiers: *Oil recycling.

Disposal of waste oil presents a crucial source of water pollution. Waste oil can contaminate water by penetrating the ground on which it is disposed and reaching groundwater below. Oil can also enter streams as effluents from sewage plants. Once in streams, it destroys bottom dwelling plants and lower marine life. An industrial society disposes of staggering amounts of waste oil. The most practical solution to oil waste management lies in providing incentives for oil waste reuse. Apparent successes have been encountered in recycling or re-refining waste oil into usable oil. To encourage recycling of waste oil, Representative Vanik has introduced legislation providing for tax

incentives for those who re-refine waste oil. Labeling standards for re-usable oil, as set by the Federal Trade Commission, would be relaxed. (Brackins-Florida)
W72-06635

THE WATER RIGHTS AND WATER POLLUTION LAW OF MISSISSIPPI.
Mississippi Agricultural and Forestry Experimentation Station, State College.
For primary bibliographic entry see Field 05G.
W72-06636

HISTORICAL, LEGAL AND INSTITUTIONAL ENVIRONMENT OF WATER AND RELATED LAND RESOURCES IN RHODE ISLAND, SECTION A--STATE LAWS.
Rhode Island Water Resources Board, Providence.

Comprehensive Water and Related Land Resources Planning, Task No. 15. 84 p, 46 ref, 7 append.

Descriptors: *Rhode Island, *Water resources development, *Riparian rights, *Water policy, *Legislation, Planning, Water law, Water rights, Legal aspects, Judicial decisions, Surface waters, Land development, Groundwater, Regulation, Well regulation, Permits, Water quality, Water supply, Impoundments, Channels, Eminent domain, State governments.

Rhode Island's laws concerning water and related land resources are summarized as a basis for planning future needs. The historical importance of water in Rhode Island is discussed, including statutes from colonial times. The development of water supply systems, from individual wells to modern municipal systems, is traced. The impact of water and related land resources is discussed along with a general discussion of statutory water law and the riparian rights doctrine. Case law and statutes bearing on surface water rights are discussed in depth. Rhode Island follows the civil law rule regarding surface water. Rights respecting access to lakes and streams, control of diffused surface water, and the use of groundwater are discussed. Legislation granting water regulatory authority is summarized, and includes drilling and abandoning wells, impoundments, channel encroachments, developments in flood plains, discharge of wastes, and construction of public water supplies. Water quality authority and the right of the state to acquire land for water supply purposes are considered. Appendixes include water related statutes and constitutional provisions, indexes to water related statutes, and interstate water classification and quality standards. (Grant-Florida)
W72-06637

PHOSPHATES IN DETERGENTS: THE CHICAGO-TYPE ORDINANCE AND OTHER REMEDIES,
For primary bibliographic entry see Field 05G.
W72-06638

REGULATION AND OWNERSHIP OF THE MARSH LANDS: THE GEORGIA MARSHLANDS ACT.
Georgia Law Review, Vol. 5, No. 3, Spring 1971. p 563-583, 108 ref.

Descriptors: *Georgia, *Tidal marshes, *Estuarine environment, Estuaries, Legislation, Intertidal areas, Tides, Marsh management, Habitat improvement, Tidal waters, High water mark, Boundaries (Property), Water level fluctuations, Regulation, State governments, Land use, Eminent domain, Land resources, Zoning, Legal aspects, Judicial decisions.

The Georgia Marshlands Act, which attempts to protect the estuarine areas of Georgia's coastline, is analyzed, with particular emphasis on its constitutionality. The Act prohibits dredging or filling of state marshlands within the estuarine area without first obtaining a permit from the Coastal Marshlands Protection Agency. Although the Act purports to be a land-use regulation, it may be susceptible to constitutional attack as a taking without compensation. The central issue is the state of the title to marshlands. An old statute attempted to alter common law state ownership of tidewater lands by conveying such lands to private owners. That act, if effective, could grant only the land below the high water mark. Regardless of whether the act was a valid grant of title, no private exploitation can be made of this land without consideration of certain public rights. There are, however, no reserved public rights to lands above the high water mark. Boundaries of marshlands are determined by tide phenomena such as spring tides. Statutory changes are suggested to alleviate possible constitutional attacks. (Smiljanich-Florida)
W72-06639

THEORIES OF WATER POLLUTION LITIGATION,
Missouri Univ., Columbia. Coll. of Law.
For primary bibliographic entry see Field 05G.
W72-06640

REFUSE ACT SUIT BROUGHT AGAINST PAPER COMPANY.

Clean Air and Water News, Vol. 4, No. 2, January 13, 1972. p 19-20, 2 p.

Descriptors: *United States, *Pulp wastes, *Treatment facilities, *Pollution abatement, Water pollution, Water pollution sources, Federal government, Political aspects, Water quality control, Water quality, Effluents, Pollutants, Administrative agencies, Legal aspects, Water law, International Joint Commission, Pulp and paper industry, *Maine.
Identifiers: *Refuse Act, *St. Croix River, Injunctions (Prohibitory), Canada.

The Justice Department filed suit seeking to enjoin the defendant pulp and paper mill from violating the Refuse Act by dumping solid wastes, color-producing agents, foaming agents, and oxygen-demanding matter into the St. Croix River. The defendant claimed it was the victim of a political hoax and that the allegations were based upon an outdated water quality test of the River by the International Joint Commission. The case was referred to the Justice Department by the Environmental Protection Agency. The mill claimed it had a pollution treatment facility which would have been in operation but for the delay created by the government. The facility will be the largest industrial pollution control project in Maine's history, and it will contain the world's first successful pulp mill effluent color removal system. The St. Croix, clogged with century-old logging and sawmill debris from U.S. and Canadian mills, forms the international boundary between Maine and New Brunswick, Canada. (Brackins-Florida)
W72-06641

NATIONAL ENVIRONMENTAL CENTER ACT OF 1971,
Congress, Washington, D.C.; and Senate, Washington, D.C.
H. F. Byrd, Jr.
Congressional Record, Vol. 117, No. 190, S 20727-20738 (daily ed.) December 7, 1971.

Descriptors: *Research facilities, *Inter-agency cooperation, *Environmental effects, *Water resources development, Legislation, Federal government, State governments, Government finance, Water policy, Federal budgets, Administrative agencies, United States, Federal project policy, Future planning (Projected), Research and development, Cost-benefit analysis, Decision making, Planning.

During the last session, the Senate passed the National Environmental Center Act of 1971. The Act would create a National Environmental Center, National Environmental Laboratories, and State Environmental Centers. The National Environmental Center would make available to policymakers the likely results of alternative courses of action, but would not advocate a particular course of action, nor would it be a proponent or opponent. Through its National Environmental Laboratories, the Center would conduct research and analyze environmental problems, including resource utilization. The Center would work closely with private environmental organizations and other governmental agencies to coordinate and avoid duplication of effort. The Center would receive both federal funds and private grants. The Center, unlike any existing organization, would have the mandate and the resources to conduct systematic interdisciplinary research on matters relating to global environment. State Environmental Centers would function on a similar capacity on the local level. The text of the Act and amendments thereto are set forth. (Brackins-Florida)
W72-06652

CORPS OF ENGINEERS CAUGHT UP IN BATTLE OF THE BUILDERS AGAINST THE PRESERVERS,
J. N. Wilford.
The New York Times, February 20, 1972, at 1, col. 1. 2 p, 1 map, 1 photo.

Descriptors: *Water resources development, *Federal project policy, *Economic justification, *Political aspects, *Rivers and Harbors Act, *Environmental effects, *Administrative agencies, Community development, Cost-benefit analysis, Project planning, Inland waterways, Water resources, Decision making, Monetary benefits, Political constraints, Government finance, Construction costs, Cost-benefit ratio, Economic feasibility, Judicial decisions, Public benefits, Administrative decisions, River systems.
Identifiers: *Corps of Engineers, Tennessee-Tombigbee Waterway, National Environmental Protection Act, Refuse Act.

The struggle between environmentalists and the Corps of Engineers mirrors the conflict between those who want to develop and utilize our natural resources promptly and those counseling prudence in order to avoid senseless destruction. The article includes a succinct history of the Corps of Engineers, its position of power, and its present methods of operation. By way of reference to several recent projects, including the Tennessee-Tombigbee Waterway and the Florida Barge Canal, the influences and considerations which guide the Corps are revealed. The political ramification of a project, the Corps' relationship to Congress, economic development of a locale, and project financing and cost-benefit analysis are considered. Despite their complaints, environmentalists are beginning to see signs of change in the Corps, such as: (1) rejection and revision of projects for environmental reasons, (2) more consultation with environmentalists, (3) a more critical Congressional attitude, and (4) new authority to police water pollution. (Brackins-Florida)
W72-06653

STATEMENTS ON INTRODUCED BILLS AND JOINT RESOLUTIONS--RIVER BASIN WASTE TREATMENT AUTHORITY ACT OF 1971,
Congress, Washington, D.C.; and Senate, Washington, D.C.
H. Humphrey.
Congressional Record, Vol. 118, No. 7, S 481-483 (daily ed.) January 26, 1972.

Descriptors: *Water pollution control, *Treatment facilities, *River basins, *River basin commissions, Political aspects, Interstate, Legislation, Federal government, State governments, Jurisdiction, Local governments, Legal aspects, Project planning, River basin development, Waste treatment, Sewage disposal, Sewage treatment, Water

quality control, Financing, Government finance, Pollution abatement, Non-structural alternatives.
Identifiers: *Water Pollution Control Act.

Senator Humphrey introduced the River Basin Waste Treatment Authority Act of 1971. The Act mandates the creation of water basin regionwide sewage authorities accountable for treating all water pollution, from whatever source, within the boundaries of a river basin. Authorities will own and manage existing plants, as well as planning and building new facilities. This new approach is necessary to attain a total system capable of coping with problems inherent in the fragmented efforts of state and local governments. The new agencies will be charged not only with planning for interstate, interlocal, and interregional cooperation, but also for building, operating, and maintaining adequate treatment facilities. The Act provides for the establishment of each river basin authority and sets forth their powers. Such authorities will be partially financed by the federal government, but will be controlled by a board composed of state and local authorities and an Environmental Protection Agency representative. After June 1973, all federal financing under the Federal Water Pollution Control Act would cease with respect to provisions covered by the Act. The text of the Act is set forth. (Horwitz-Florida)
W72-06654

LEGISLATIVE RESPONSE TO 'SOFT SOAP' ON DETERGENTS,
Congress, Washington, D.C.; and Senate, Washington, D.C.
T. J. McIntyre.
Congressional Record, Vol. 117, No. 170, S 18015-18023 (daily ed.) November 10, 1971.

Descriptors: *Detergents, *Phosphates, *Water pollution sources, *Pollution abatement, Eutrophication, Legislation, Public health, Water quality control, Algal control, Federal government, Nutrients, Sewage treatment, Water pollution, Water pollution effects, Research and development, Waste water treatment, Biodegradation, Local governments, Municipal wastes, Administrative agencies, Great Lakes.

Phosphate detergents are a major cause of the death of many lakes and rivers. Although the effects of phosphate detergents are well known, the federal government has been recalcitrant in taking action to control their use. The most ostensible reason is the lack of a safe and effective substitute. Another reason is the normal delay when there are powerful interests or opposition to such action. A proposal before the Senate Commerce Committee's Environmental Subcommittee would accomplish the following: (1) limit the phosphate content in detergents for the present, with a clear mandate for their eventual total removal; (2) establish test protocols, standards, and regulations for all detergent ingredients; and (3) establish a federal program for the development of safe substitutes which will not harm the environment. Some, including the detergent industry, claim elimination of phosphates at the sewage treatment stage is the most effective method of dealing with the problem. Stricter labeling requirements, disclosing the amount of phosphate in a detergent, are also offered as an immediate step which could be taken to partially alleviate the problem. (Brackins-Florida)
W72-06655

WATER BANK ACT (A BILL TO PROVIDE FOR CONSERVING SURFACE WATERS, TO CONTRIBUTE TO IMPROVED WATER QUALITY AND REDUCE STREAM SEDIMENTATION, AND FOR OTHER PURPOSES).
House Bill No. 11717, 91st Cong, 1st Sess. (1969). 6 p.

Descriptors: *Wetlands, *Contracts, *Waterfowl, *Wildlife conservation, *Agriculture, Farms, Federal government, United States, Conservation, Compensation, Regulation, Administrative agencies, State governments, Land management, Land tenure, Freshwater marshes, Coastal marshes, Landfills, Land development, Land clearing.

To prevent the loss of wetlands, the Secretary of Agriculture would be authorized by this bill to formulate and administer a continuous program of agreements with producers in the migratory waterfowl nesting and breeding areas for the conservation of water in farm or ranch wetlands and artificial ponds. Such agreements would continue for a ten-year period. A producer would place lands in the program with the right to use them for agricultural purposes or, under a nonuse option, foregoes their use for agricultural purposes. The agreement would prohibit burning, draining, or filling wetlands. Wetlands covered by federal or state easement permitting agricultural use may be placed under the nonuse option. The Secretary would make annual payments and part of the average cost of establishing and maintaining authorized practices and uses. Agreements may be renewed or extended for an additional period of 10 years. The Secretary shall utilize state and federal agencies and appoint an advisory board. Regulations shall be promulgated when necessary. (Rees-Florida)
W72-06656

INDUSTRIAL POLLUTION ABATEMENT AND PREVENTION ACT OF 1967 (A BILL TO PROVIDE A PROGRAM OF ECONOMIC INCENTIVES TO ASSIST AND ENCOURAGE INDUSTRY TO ASSUME ITS RESPONSIBILITY FOR ABATING AND PREVENTING THE POLLUTION OF WATER BY WASTES FROM INDUSTRIAL SOURCES).
Senate Bill No. 848, 90th Cong, 1st Sess. (1967). 11 p.

Descriptors: *Pollution abatement, *Water pollution control, *Industrial wastes, *Federal government, *Grants, Water pollution sources, Industrial water, Sewage, Sewage treatment, Administrative agencies, Legal aspects, Social aspects, Research and development, Sanitary engineering, Waste treatment, Treatment facilities, Municipal wastes, Cities, Local governments.
Identifiers: *Water Pollution Control Act.

Water pollution is seriously damaging the quality of human life. Industry is the most significant source of such pollution and industrial treatment processes are largely inadequate. Waste discharges must be reduced, and the cost must be shared by business, government, and the public. The Act would amend the Water Pollution Control Act to establish a program to abate and prevent industrial pollution by providing economic incentives to business, encouraging joint municipal waste treatment facilities, strengthening the enforcement process, and fostering research and development on advanced waste treatment methods. The Secretary of the Interior would be authorized to make loans to persons for the construction or installation of pollution control facilities and the modification of facilities in order to substantially reduce water pollution. The Secretary would monitor research in the field of waste control, make annual reports, and make grants to local governments to assist in projects which will demonstrate new features of water treatment. Grants for industrial waste treatment projects would be increased. Certain polluters would be required to file reports describing the character of pollutants discharged and methods used to prevent or reduce pollution. (Grant-Florida)
W72-06657

PRICE INTRODUCES WATER QUALITY BILL,
Congress, Washington, D.C.; and House, Washington, D.C.
R. Price.
Congressional Record, Vol. 117, No. 172, E 12131 (daily ed.) November 12, 1971.

Descriptors: *Water pollution control, *Federal government, *Pollution abatement, *Grants, Political aspects, Legislation, Government finance, State governments, Jurisdiction, Participating funds, Treatment facilities, Legal aspects, Administration, Administrative agencies, Water policy.
Identifiers: *Water Pollution Control Act.

Representative Price introduced a series of amendments to the Federal Water Pollution Control Act designed to correct what Representative Price and the Administration consider substantial defects in the Senate-passed measure. The first point of controversy is the amount of federal expenditures. The Senate proposal diverted excessive funds to water pollution control. While appropriating less funds, Price's proposals are aimed at eliminating water pollution by 1985. The role of states in combating pollution is given greater weight by Price. The primary duty of fighting pollution would rest with the states. The Senate's reliance on the Environmental Protection Agency is deemed an improper balance between the federal and state governments. The 70% federal share of financing water pollution control and waste treatment facilities, contained in the Senate bill, is rejected by Price who would retain the present 55% figure. Generally, changes made in the Senate bill are technical and designed to make the war on water pollution more efficient. (Horwitz-Florida)
W72-06658

HOLZ V. LYLES (RIGHT OF ACCESS OVER ACCRETED LAND).

251 So.2d 583-591 (Ala. 1971). 4 map.

Descriptors: *Alabama, *Easements, *Land tenure, *Accretion (Legal aspects), *Access routes, Legal aspects, Judicial decisions, Roads, State governments, Jurisdiction, Public rights, Boundaries (Property), Recreation, Boundary disputes, Streams, Highways.

Plaintiff owner of land adjoining the southern edge of a public road sought to restrain defendant occupiers of land adjoining the northern edge of the road from obstructing his access to a creek. The land occupied by defendants had gradually built up along the northern edge of the road by accretion. Defendants constructed facilities on the land between the road and the creek, thus interfering with plaintiff's access to the creek. Defendants claimed no private action could lie for obstructing the road because it was not a public highway. The Supreme Court of Alabama held that land which was an accretion along the edge of a public road becomes a part of the road subject to the same uses. Plaintiff was, therefore, held entitled to an injunction restraining defendants from interfering with his right of access to the accreted land for the purpose of reaching a creek. (Horwitz-Florida)
W72-06659

HIGDAY V. NICKOLAUS (CITY'S RIGHT TO WITHDRAW PERCOLATING GROUNDWATER).
469 S.W.2d 859-872 (K.C. Ct. App. Mo. 1971). 1 map.

Descriptors: *Missouri, *Municipal water, *Percolating water, *Water demand, Legal aspects, Local governments, Judicial decisions, Water supply, Public rights, Riparian rights, Eminent domain, Subsurface waters, Wells, Well regulation, Civil law, Groundwater movement, Groundwater, Aquifers, Remedies, Damages.

Plaintiff landowners sought a declaratory judgment that defendant city, as an adjoining landowner, could not extract percolating waters from under plaintiffs' land for sale away from the premises. Plaintiffs owned 6000 acres of farm land overlying an alluvial water basin. Defendant acquired a few acres of land and drilled wells from

which water was to be withdrawn and sold to the city's inhabitants. After tracing the development of modern law relating to groundwater, the Kansas City Court of Appeals held that under the rule of reasonable use the measure of an overlying landowner's right to use percolating groundwater is whether it is for purposes incident to beneficial enjoyment of the land from which it is taken. Plaintiffs' pleadings were held sufficient to invoke the trial court's jurisdiction to consider their request for relief. Therefore, the lower court's dismissal of plaintiff's petition was reversed. The court noted, however, that the lower court might condition injunctive relief upon the defendant's exercise of eminent domain to acquire the water rights it was violating. (Horwitz-Florida)
W72-06660

AN ACT TO AUTHORIZE CITIES, TOWNS, COUNTIES, AND THE ARKANSAS SOIL AND WATER CONSERVATION COMMISSION, WHERE NECESSARY, TO ENACT AND ENFORCE LAND USE MEASURES WHICH WILL PREVENT AND ALLEVIATE FLOOD HAZARDS AND L OSSES IN FLOOD-PRONE AREAS OF THE STATE AND FOR OTHER PURPOSES.
Act 629 (1969), Arkansas Acts 1388-1391.

Descriptors: *Arkansas, *Flood protection, *Land management, *Floodproofing, *Flood plain zoning, Land use, Flood damage, Land development, Legislation, Local governments, Regulation, Zoning, Building codes, Public health, Economic justification, Floods, Flood plains, Flood plain insurance, Flood control, Non-structural alternatives.

In recognition of the effects flooding has had in the flood-prone areas of Arkansas, each city, town, or county is authorized to enact and enforce ordinances, building or zoning codes, or other appropriate measures regulating the management and use of land in flood-prone areas. Local governments shall attempt to guide development away from locations threatened by flood damage and to require the flood-proofing of structures which are constructed in flood-prone areas. If local government fails to adopt adequate regulatory measures, the State Soil and Water Conservation Commission may enact such measures following a public hearing. Those who violate the Act by building or maintaining structures in hazardous areas may be subjected to an injunction and/or a fine up to $100 per day. (Brackins-Florida)
W72-06661

HOLVERSTEN V. MINNESOTA WATER RESOURCES BOARD (POWER OF WATER RESOURCES BOARD TO CREATE WATERSHED DISTRICT).
188 N.W.2d 923-925 (Minn. 1971).

Descriptors: *Minnesota, *Administrative decisions, *Water management (Applied), *Watershed management, Watersheds (Basins), Public benefits, Water control, Legislation, Judicial decisions, Legal aspects, Administrative agencies, State governments, Administration, Surface water, Legislation, Supervisory control (Power), Adjudication procedure.
Identifiers: *Watershed districts.

Plaintiff property owners challenged the validity of an order of defendant water resources board establishing a watershed district. Under Minnesota statutes defendant was required to determine whether the establishment of a watershed district would be for the public welfare and interest, and whether statutory conservation purposes would be served by the establishment of such a district. Plaintiffs alleged that they had no water problems and did not want a watershed district established. The Minnesota Supreme Court held that in light of the legislative declaration that conservation of natural resources through land utilization and flood control should be effectuated by watershed districts, the record supported the finding of defendant board that the watershed district would be for the public welfare and in the public interest. The court ruled that the district's establishment would subserve the statutory purposes. The lower court's affirmation of defendant's order was, therefore, affirmed. (Brackins-Florida)
W72-06662

EMERALD VALLEY LAND DEVELOPMENT CO. V. DIEFENTHALER (DUTY OF LOWLAND OWNER TO ACCEPT SURFACE WATER WHICH NATURALLY DRAINS ONTO HIS LAND).

192 N.W.2d 673-674 (Ct. App. Mich. 1971).

Descriptors: *Michigan, *Drainage effects, *Flood damage, Drainage, Legal aspects, Judicial decisions, State governments, Surface drainage, Ditches, Damages, Remedies, Land tenure, Relative rights, Surface waters, Surface runoff, Adjudication procedure.

Plaintiff lowland owners sought injunctive relief and damages for the diversion of water onto their property by defendant dominent landowners. Defendants constructed a series of artificial drainage ditches upon their land. Plaintiffs contended defendants' actions diverted large quantities of water onto their land by reversing natural flow. Defendants claimed the entry of water was caused by natural drainage. The Court of Appeals of Michigan, Division Two, held that an owner of lowlands is required to accept surface water which naturally drains onto his land. Moreover, the owner of a dominent estate has a right to fill up sag-holes and avoid the accumulation of water in the course of improving his land even if this results in water draining onto a servient estate. A dominent owner may not, however, cast additional waters upon the servient estate so as to cause damage. The court ruled plaintiffs' complaint was properly dismissed by the lower court upon finding that the excess water was due to natural drainage. The court noted that a lower court's findings are entitled to special weight when the trial judge has viewed the scene of the alleged damage. (Horwitz-Florida)
W72-06663

SPRADLEY V. SOUTH CAROLINA STATE HIGHWAY DEPT. (LIABILITY FOR ALTERATION OF DRAINAGE THROUGH HIGHWAY CONSTRUCTION).
182 S.E.2d 735-738 (S.C. 1971).

Descriptors: *South Carolina, *Surface drainage, *Drainage effects, *Drainage engineering, *Highway effects, Eminent domain, Surface waters, Drainage, Surface runoff, Drains, Public rights, Judicial decisions, Legal aspects, State governments, Administrative agencies, Damages, Remedies.

Plaintiff property owner sued defendant state highway department for compensation for damages to, and the taking of, property caused by the dumping and spilling of surface water thereon, as a result of highway improvement. Plaintiff contended that before the highway was widened surface water had properly drained without flooding, spilling, or accumulating upon her property. Plaintiff also averred that defendant, upon widening the highway, failed to provide for proper drainage of water from said highway. Defendant's construction engineer testified that the highway was constructed in a manner which would allow water to drain from plaintiff's land. The Supreme Court of South Carolina held that a highway department, in improving roads, has no duty to provide perfect drainage, but it must furnish drainage at least equal in capacity and efficiency to that existing prior to improvement. The court held the evidence as to the construction of the highway presented a jury question. The verdict for plaintiff was, therefore, affirmed. (Brackins-Florida)
W72-06664

ENVIRONMENTAL DEFENSE FUND, INC. V. CORPS OF ENGINEERS.
325 F. Supp. 749-763 (E.D. Ark. 1971).

Descriptors: *United States, *Federal project policy, *Environmental effects, *Dam construction, Water rights, Coordination, Administration, Federal government, Legal aspects, Administrative agencies, Judicial decisions, Legislation, Project planning, Regulation, Dams, Balance of nature, Planning, Water resources development, Decision making, Costs, Optimum development plans, Inter-agency cooperation.
Identifiers: *National Environmental Policy Act, *Environmental impact statements.

Plaintiff conservationists sought injunctive relief against defendant Corps of Engineers and others to terminate a dam project. The project was partially completed when the National Environmental Policy Act of 1969 became effective. Plaintiffs contended environmental impact statements issued by defendants did not meet the requirements of the Act as to a detailed study of important environmental factors. The United States District Court for the Eastern District of Arkansas found that defendants were not in compliance with the Act and enjoined continuation of the project until the Act was satisfied. The court ruled that: (1) it was not for the courts to determine whether or not a project was proceeding in accordance with its authorization; (2) the Act did not create any substantive rights to a safe environment; and (3) an ongoing project should be viewed differently than a new one, but detailed environmental impact statements are still required. The Court held that defendants' statements did not comply with the Act because they failed to: (1) utilize a systematic, interdisciplinary approach in evaluating environmental impacts, (2) adequately explore alternatives to the proposed action, (3) include comments of all appropriate agencies, and (4) make full disclosure of all known environmental consequences. (Johnson-Florida)
W72-06665

KINCAID V. UNITED STATES (CONDEMNATION OF FLOODWAYS).

37 F.2d 602-698 (W.D. La. 1929).

Descriptors: *Eminent domain, *Floodways, *Floodrouting, *Condemnation value, Condemnation, Land tenure, Judicial decisions, Water law, Legal aspects, Compensation, Flood control, Flood damage, Flood protection, Floods, Runoff, Overflow, Diversion structures, Levees, Public rights.

Plaintiff landowner sought to restrain defendant United States from using his land as a floodway without compensation. A Corps of Engineers' flood control project provided for the intentional channeling of flood waters down the basin where plaintiff's land was located. Defendant contended that as a result of the project the Mississippi would carry a greater volume of water, and therefore, the basin would receive less overflow than in the past. Defendant also contended that since the floodway would not be used until the area would have been flooded anyway, no protection was taken away from plaintiff. The U.S. district court held that defendant was required to pay plaintiff for the floodway rights it sought to exercise. When the government enters the field of flood control for the protection and reclamation of private lands, it becomes responsible for the invasion of private rights. Owners of land subject to overflow from navigable or non-navigable streams are entitled to have them continue in their natural state, and no public easement beyond the natural one can arise without just compensation. (Robinson-Florida)
W72-06666

RIGHT TO FOLLOW ACCRETIONS ACROSS DIVISION LINE PREVIOUSLY SUBMERGED BY ACTION OF WATER.
American Law Reports, Annotated, Vol. 8, p 640-644, 1920.

Descriptors: *Riparian land, *Boundaries (Property), *Land tenure, *Accretion (Legal aspects), Legal aspects, Water law, Riparian rights, Boundary disputes, Bank erosion, Erosion, Submergence, Beds, Ownership of beds, Real property, Relative rights.

A number of cases are cited which support the proposition that where land bordering on a stream is washed away and an accretion to the land of another subsequently extends over the same place, the newly formed land belongs to the owner of the land to which it is an accretion, rather than the original owner of the land. This rule is also applied where a river encroaches on property on one side of the river and forms accretion on the other side. It is also applied where riparian land is completely washed away and accretion attaches to new riparian land and extends beyond the original boundary of this new riparian land. The accretion belongs to the riparian owner whose land is the base for the accretion. However, other cases have held that this rule is not applicable where it is possible to determine the former boundary line. Under this theory, any accretion covering an area owned by the former riparian will belong to that owner. Moreover, the general rule has not been applied in cases where the boundary line was not the water's edge but was some other line, such as a plat line. Cases from numerous jurisdictions are cited. (Johnson-Florida)
W72-06667

RIGHT TO FOLLOW ACCRETIONS ACROSS DIVISION LINE PREVIOUSLY SUBMERGED BY ACTION OF WATER.
American Law Reports, Annotated, Vol. 41, p 395-398, 1926.

Descriptors: *Land tenure, *Riparian land, *Accretion (Legal aspects), *Boundaries (Property), Legal aspects, Water law, Judicial decisions, Riparian rights, Boundary disputes, Bank erosion, Erosion, Submergence, Beds, Ownership of beds, Legislation.

It is well established that a riparian owner loses his rights in land if it is entirely washed away and that he has no right to accretions to the land of another which extend within his original boundaries, even if the accretions are to land originally nonriparian. This supplemental annotation deals with the situation where only a portion of the original riparian land is washed away before accretion commences. A reported case held that the original riparian was not entitled to all accretion formed within his original boundaries, when the accretion began to form on several adjoining riparian lands. The court said that a property line ceases to exist when land is submerged. The accretion should be apportioned to riparian owners according to water frontage at the time accretion commences. Several states have denied the right of a nonriparian owner, whose lands had become riparian by the washing away of intervening land, to follow accretions across a former boundary line. Cases from several jurisdictions are examined. (Johnson-Florida)
W72-06668

RIGHT OF PUBLIC TO USE SHORE OF INLAND NAVIGABLE LAKES BETWEEN HIGH AND LOW WATER MARK.
American Law Reports, Annotated, Vol. 31, p 978-979, 1924.

Descriptors: *Public rights, *Riparian rights, *Water level fluctuations, *Boundaries (Property), *Navigable waters, *Lakes, Banks, Legal aspects, Water law, Boundary disputes, Competing uses, Condemnation, Easements, Economics, Judicial decisions, Navigation, Land tenure, Water rights, Riparian land, Lake beds, Ownership of beds, High water mark, Low water mark.

The relative rights of riparian landowners and the public in land lying between the high and low water marks of an inland navigable lake where water has receded temporarily to the low water mark, are examined in this annotation. Free use of such land by the public would tend to diminish the value of adjoining land of riparians. One of two reported cases held that a riparian owner had title to the soil down to the low water mark and, therefore, had the right to prevent the public from using the land. The other reported case held that, irrespective of ownership, the established rights of a riparian landowner entitled him to exclude the public. According to the court, these rights included the exclusive privilege of using the shore for access to land and the water. Another case indicated that the public had certain rights, in addition to those of navigation, in the land lying between the high and low water marks of navigable lakes, but these rights were not clearly specified. (Johnson-Florida)
W72-06669

BUSECK V. N.Y.C. AND ST. L. RY. (CONTRACTUAL LIABILITY FOR OBSTRUCTION OF SURFACE DRAINAGE).
99 Pa. Super. 310-315 (1930).

Descriptors: *Pennsylvania, *Flood damage, *Surface runoff, *Surface drainage, *Contracts, Drainage water, Judicial decisions, Legal aspects, Water law, Damages, Remedies, Floods, Water injury, Runoff, Floodwater, Surface waters, Drainage, Drainage systems, Ditches, Third party effects.

Plaintiff landowner sought a mandatory injunction to compel defendant railroad to remove an obstruction to surface drainage and to recover damages for excess surface water on plaintiff's land. Plaintiff's grantor conveyed to defendant railroad a right of way with a covenant requiring defendant to maintain a ditch along the tracks sufficient to drain the grantor's lands. Defendant constructed the ditch and a culvert under its tracks. A second railroad, however, constructed another set of tracks which obstructed the flow of surface water and flooded plaintiff's land. Plaintiff argued that defendant was required to dispose of this water even though it was not responsible for the obstruction. The Chancellor found for defendant and the Pennsylvania Superior Court affirmed. Defendant was not held liable for plaintiff's injuries because the proximate cause of the excess surface water was another railroad company, and the covenant did not impose liability on defendant for the acts of another railroad. (Robinson-Florida)
W72-06670

CONSTITUTIONALITY OF STATUTES AFFECTING RIPARIAN RIGHTS.
American Law Reports, Annotated, Vol. 56, p 277-303, 1928.

Descriptors: *Riparian rights, *Condemnation, *Judicial decisions, *Eminent domain, Prior appropriation, Adjudication procedure, Legal aspects, Water law, Public rights, State governments, Water rights, Competing uses, Permits, Regulation, Water allocation (Policy), Legislation, Water resources development, Natural flow doctrine, Reasonable use, Relative rights, Water utilization, Riparian land, Real property.
Identifiers: *Constitutionality.

The constitutionality of a particular statute affecting a riparian owner's rights is generally determined by whether or not application of a statute constitutes a taking of property. It is well settled that riparian rights may not constitutionally be taken except for public use and upon payment of just compensation. The constitutionality of regulatory statutes is discussed with reference to: (1) vesting judicial power in an administrative body or vice versa, (2) denial of due process of law, or (3) discriminatory or class legislation. Situations in which a riparian's right to fish and other miscellaneous rights are affected are also examined. Cases from numerous jurisdictions are cited. (Johnson-Florida)
W72-06671

KUCZINESKI V. SCRANTON COAL CO. ET. AL. (LIABILITY FOR WASHING OF FILL ONTO ADJOINING LANDS).
99 Pa. Super. 20-26 (1930).

Descriptors: *Pennsylvania, *Surface runoff, *Deposition (Sediments), *Surface drainage, *Remedies, Soil erosion, Judicial decisions, Legal aspects, Water law, Land tenure, Real property, Runoff, Surface waters, Damages, Erosion, Land use, Sediment transport.

Plaintiff landowner sought to enjoin defendant railway and coal company from permitting culm, ashes, and stone to wash down upon his land. Defendant constructed its track on a right of way adjacent to the plaintiff's property, using a fill of ashes and culm. Approximately forty-five years later the state altered certain highways which caused surface water to drain over the right of way and wash ashes, culm, and stone onto plaintiff's property. Although there was no evidence of negligence by defendant, the trial court entered a decree requiring defendant to erect a retaining wall and pay damages. The Pennsylvania Superior Court held there is no liability for the consequences of washing of materials upon adjoining property where the material has existed for a long time without causing damage and where changing conditions and actions of third persons, over which a defendant has no control, diverted water over his property thereby washing material onto another's property. The decree in favor of plaintiff was reversed upon a finding that defendants were not liable. (Robinson-Florida)
W72-06672

CITY OF MUNCIE V. SHARP (PROPERTY OWNERSHIP REQUIRED TO MAINTAIN ACTION FOR SURFACE WATER DAMAGE).
165 N.E. 264-265 (Ct. App. Ind. 1929).

Descriptors: *Indiana, *Surface drainage, *Flood damage, *Adjudication procedure, Real property, Storm runoff, Surface water, Storm drains, Surface runoff, Judicial decisions, Pipes, Legal aspects, Roads, Floods, Water law, Cities.

Plaintiff's complaint alleged that his home and lot were damaged by surface water diverted by defendant municipality. The Indiana appellate court held the lower court's judgment for plaintiff was not sustained by the evidence. The court stated that the action had been tried on the theory that plaintiff was the owner of the damaged property, yet the undisputed evidence showed that plaintiff had not become the owner until after commencement of his action. The court ruled plaintiff had not met the requirements of an Indiana statute and was, therefore, barred from bringing an action for damage caused by diverted surface waters. (Madsen-Florida)
W72-06673

FINCH V. SMITH (PRESCRIPTIVE RIGHT TO REBUILD LEVEE).
7 Tenn. App. 65-75 (1928).

Descriptors: *Tennessee, *Prescriptive rights, *Levees, *Flood protection, Surface runoff, Dikes, Flood control, Streams, Local governments, Roads, Land tenure, Surface drainage, Drainage water, Repulsion (Legal aspects), Legal aspects, Judicial decisions.

Plaintiff landowner sought to enjoin defendant landowner from maintaining a dike which backed up surface water on plaintiff's land. Before defendant purchased, the county had erected a dike along the common boundary between the land of plaintiff and defendant. The county abandoned the dike, and it was destroyed. Defendant repaired the dike when he purchased his land and subsequently maintained it. Additionally, a dike parallel to de-

fendant's existed on plaintiff's land. This dike had protected both plaintiff and defendant from overflow, but plaintiff destroyed this dike, although it had existed for more than 20 years. Defendant claimed a prescriptive right to maintain the dike on his land and, thereby, to overflow plaintiff's land. Since defendant's dike was destroyed when he purchased and prior to that had not been maintained for 20 years, the Tennessee appellate court held that defendant had no prescriptive right to the dike on his land. Defendant, nevertheless, claimed a right to maintain his dike because he held a prescriptive right to the protection afforded by the dike on plaintiff's land, which had been maintained more than 20 years. The court upheld this contention, stating that since plaintiff deprived defendant of the protection afforded by plaintiff's dike, defendant was entitled to protect himself by building his own dike. (Hart-Florida)
W72-06674

WHITE V. NASHVILLE C. AND ST. L. RY. (RAILROAD'S DUTY TO PREVENT OBSTRUCTION OF NATURAL DRAINAGE).
1 Tenn. App. 467-477 (1925).

Descriptors: *Tennessee, *Railroads, *Culverts, *Surface drainage, Drainage, Ponding, Ponds, Farms, Surface runoff, Landfills, Drainage, Legal aspects, Water law, Judicial decisions, Relative rights.

Plaintiff farmer sought damages and a mandatory injunction to prevent defendant railroad from maintaining a pond on his land. Defendant's tracks were built upon an embankment in a small valley on plaintiff's land. A culvert passed through the embankment to permit natural drainage. Through time, the valley floor raised four feet, by erosion and sedimentation, filling the culvert. Consequently, a stagnant pond was created beside the embankment on plaintiff's land. Defendant contended that plaintiff was obligated to dig a ditch to drain the water. Plaintiff asserted that defendant was obligated to raise its culvert to permit drainage. The Tennessee appellate court held that a railroad has a continuing duty to elevate culverts in its embankments to meet changed conditions so as to allow natural drainage. The court ruled that defendant must raise the culvert and that plaintiff was not obligated to construct a ditch. Since the injury was continual, a mandatory injunction was issued. (Hart-Florida)
W72-06675

PHOSPHATES AND THE CANADA WATER ACT,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 05B.
W72-06777

REGIONAL WATER PLANNING: THE LEGAL TAPESTRY,
California Dept. of Justice, Sacramento.
T. C. Lynch.
American Bar Association Section on Public Utility Law, Vol. 1966, p. 10-15, 1966.

Descriptors: *Water resources development, *Water allocation (Policy), *Project planning, *Water damand, *Distribution systems, Allocation (Policy), Water supply, Legal aspects, Federal government, Water control, Water shortage, Water users, Water utilization, Public rights, Judicial decisions, Legislation, Water transfer, Financing, Water delivery, Inter-basin transfers.

Future population expansion, particularly in the Southwest, will place tremendous demands upon water resources. The only method of meeting this demand is through hugh regional water projects. Great man-made rivers of surplus water flowing from water-rich areas, such as the Pacific Northwest, to water deficient areas, such as the Colorado River Basin, will be needed. The ultimate burden of building such systems rests upon the federal government for two reasons: (1) only the federal government will be able to finance such large systems, and (2) legal difficulties pose pragmatic problems that can best be overcome through federal action. Congress clearly has the power to divert and distribute the waters of a navigable stream among various states. To implement this power, an administrative official may be authorized to conduct extensive regional water distribution. The most immediate requirement, to insure adequate future water supplies, is for extensive federal study programs of regional and multi-regional water plans. (Horwitz-Florida)
W72-06836

LEGAL ASPECTS OF DRAINAGE IN NEW ENGLAND: A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from the National Technical Information Service as PB-208 219, $3.00 in paper copy, $0.95 in microfiche. Water Resources Scientific Information Center, WRSIC 71-212. October 1971. 125 p.

Descriptors: *New England, *Legal aspects, *Drainage practices, *Riddance (Legal aspects), *Bibliographies, *Repulsion (Legal aspects), Water law, Abstracts, Information retrieval, Judicial decisions, Legislation, Publications, Regulation, Northeast U.S., Data collections, Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, Drainage, Surface runoff, Surface waters, Drainage programs.

Abstracts of legislation, judicial decisions, regulations, and comment concerning drainage in New England are set forth. Materials from Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, and other jurisdictions are included. Numerous aspects of drainage law are covered, including: administration, easements, damages, diversions, liability, and remedies. The bibliography, one of a series, was produced wholly from Selected Water Resources Abstracts. A significant descriptor index and a comprehensive index are included. (Earl-Florida)
W72-06869

THE ROLE OF THE ENVIRONMENTAL PROTECTION AGENCY,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-06871

ENVIRONMENTAL LITIGATION: STRENGTHS AND WEAKNESSES,
American Native Rights Fund, Boulder, Colo.
For primary bibliographic entry see Field 06G.
W72-06872

CONSTITUTIONAL IMPLICATIONS OF WETLANDS LEGISLATION,
J. W. Gannon, Jr.
Environmental Affairs, Vol. 1, No. 3, p. 654-669, November 1971. 98 ref.

Descriptors: *Estuarine environment, *Environmental effects, *Dredging, *Landfills, Land tenure, Legal aspects, Water law, Administration, Competing uses, Economics, Permits, Judicial decisions, Legislation, Regulation, State governments, Third party effects, Water resources development, Ecology, Habitats, Productivity, Estuaries, Compensation, Wetlands, Political aspects, Maine.
Identifiers: *Contitutionality.

The ecological importance of coastal estuaries has been recognized by state legislatures which have enacted wetland conservation laws designed to prevent destruction of these areas. Such laws are unpopular with certain commercial interests because they usually require a permit before wetlands can be filled. The recent case of State v. Johnson, which held Maine's wetlands legislation unconstitutional as an improper exercise of the state's police power and as a taking of private property without just compensation, is examined. The Johnson court erred because: (1) it underestimated the fundamental importance of coastal estuaries as a natural resource, (2) cases relied upon by the court were significantly distinguishable, (3) recent cases have recognized the need for extensive police controls over crucial environmental matters, and (4) the court ignored possible compromise solutions--it could have allowed filling of only selected portions of the area or required special construction methods. Because wetlands have been acknowledged as invaluable natural resources, wetlands legislation constitutes a reasonable exercise of the state's police power, despite the Johnson case. (Johnson-Florida)
W72-06874

VALIDITY OF PATENTS CONVEYING NAVIGABLE WATERBOTTOMS--ACT 62 OF 1912, PRICE, CARTER, AND ALL THAT,
Louisiana State Univ., Baton Rouge. Coll. of Law.
A. N. Yiannopoulos.
Louisiana Law Review, Vol. 32, p. 1-18, December 1971. 76 ref.

Descriptors: *Louisiana, *Ownership of beds, *Navigable waters, *Public rights, Judicial decisions, Civil law, Water law, Legislation, Statutes, Legal aspects, Riparian rights, River beds, Prescriptive rights, Lake beds, State governments, Land tenure, Non-navigable waters, Real property.

It is well-established law in Louisiana that beds of navigable waters are public things, insusceptible of private ownership. Act 247 of 1855 authorized the sale of shallow non-navigable lakes and swamplands. Act 124 of 1882 assimilated dried up navigable lakes to swamplands and authorized their sale. Subsequently, Louisiana issued patents conveying large areas containing both navigable and non-navigable waters. To promote security of title, Act 62 of 1912 was passed to require that actions to annul patents be brought within six years of their issuance. On this basis, Louisiana courts originally held patents including those to navigable waterbottoms valid. Louisiana courts have, however, recently reconsidered the interpretation and scope of the 1912 statute. The question is whether the statute was intended to apply to patents including beds of navigable waters, since such lands could not be alienated prior to that time. Based on recent decisions answering the question in the negative, it is concluded that early decisions holding patents to navigable waterbottoms valid will soon be overruled. (Doise-Florida)
W72-06875

FEDERAL COURTS--JURISDICTION--A COMPARISON OF TEXAS V. PANKEY AND OHIO V. WYANDOTTE CHEMICAL CORP. REVEALS THE NECESSITY FOR A FEDERAL COMMON LAW RIGHT TO ABATE INTERSTATE POLLUTION.
For primary bibliographic entry see Field 05G.
W72-06876

INTERNATIONAL PROBLEMS CONCERNING POLLUTION AND THE ENVIRONMENT,
P. Rawlinson.
Natural Resources Lawyer, Vol. 4, p. 804-808, November 1971.

Descriptors: *International waters, *Disasters, *Foreign countries, *Pollution abatement, Remedies, Water law, Water pollution control, Accidents, Damages, Hazards, Safety, Water pollution sources, Regulation, United Nations, Environmental effects, Non-structural alternatives.
Identifiers: *International agreements.

A comprehensive approach to marine pollution by and among nations is proposed. Several water pollution experiences involving the English Channel are reviewed. When a tanker ran around in 1967, beyond the jurisdiction of both England and France, the coasts of both countries were damaged. Through cooperation, the two governments settled their claims with the owners. The disaster opened a new chapter in international recognition of the pollution problem and the need for cooperation in fighting it. The 1969 North Sea Agreement is an example of regional cooperation. Several international conventions resulting in agreements have also followed. The Intergovernmental Maritime Consultative Organization has enacted a traffic separation plan to lower the risk of accidents in the Dover Strait. The best approach is a regional one that is comprehensive in nature. However, all pathways of pollution must be restricted, not just dumping from ships. (Doise-Florida)
W72-06877

LEGAL ASPECTS OF SEABED PETROLEUM AND MINERAL RESOURCE DEVELOPMENT--THE DRAFT UNITED NATIONS CONVENTION ON THE INTERNATIONAL SEABED AREA AND THE UNITED STATES WORKING PAPER SUBMITTED TO THE UNITED NATIONS SEABED COMMITTEE.

Natural Resources Lawyer, Vol. 4, p. 681-747, November 1971.

Descriptors: *United Nations, *Boundaries (Property), *Boundary disputes, *International law, Accretion (Legal aspects), Foreign countries, Governments, Continental shelf, Oceans, Oil fields, Oil industry, Bank erosion, Submerged Lands Act, Law of the sea, International waters, Treaties.

Several addresses delivered to the United Nations Seabed Committee are presented. Several comment on the United States Working Paper submitted by the President as part of his ocean policy proposal. An accommodation of the various national interests involved constituted the proposal's basis. A treaty dealing with a seabeds regime and boundaries, as well as establishment of a 12-mile territorial sea through international agreement, is proposed. The Outer Continental Shelf Lands Act has worked very well in regulating and fostering offshore oil and gas development. Three future problem areas under the Act: (1) regulation of operations as industry locates farther from the coast, (2) protection of the environment, and (3) jurisdiction over seabed minerals are discussed. Offshore boundary and title issues are discussed also. Specifically, the problem is explored in relation to California, Louisiana, Texas, Florida, Alabama, Mississippi, Alaska, and the Atlantic States. Some of the problems facing offshore mineral lessees are also evaluated. (Doise-Florida)
W72-06878

QUI TAM ACTIONS FOR CITIZEN ENFORCEMENT OF THE REFUSE ACT OF 1899 AGAINST POLLUTERS,
Cleveland State Univ., Ohio. Coll. of Law.
For primary bibliographic entry see Field 05G.
W72-06879

PUBLIC TRUST AS A CONSTITUTIONAL PROVISION IN MONTANA (DOCTRINE IN UNITED STATES GENERALLY),
B. Leaphart.
Montana Law Review, Vol. 33, p. 175-186, Winter 1972. 49 ref.

Descriptors: *Montana, *Public rights, *Water policy, *State governments, *Ownership of beds, Rlative rights, Recreation, Water law, Water rights, Social aspects, Water demand, Legislation, Legal aspects, Regulation, Land tenure, Beds, Judicial decisions.
Identifiers: *Constitutional law, *Public trust doctrine.

The history of the public trust doctrine, dating back to early Roman law and to the English common law, is examined. The 19th Century United States Supreme Court adopted the concept, but it was applied only to navigable waters and shorelands. Limited use of the doctrine has continued into the Twentieth Century; only the courts of Wisconsin and Massachusetts have employed it to protect their resources. The United States Supreme Court indicated that the people have an absolute interest in public land and water which cannot be unconditionally conveyed under any circumstances. State courts, however, have interpreted the doctrine as requiring a balancing of interests. The limited presence of the public trust concept in constitutional and statutory provisions is discussed. A public trust doctrine provision is proposed for the new Montana constitution. The nature of the proposed trust, its applicability, and its enforcement, are detailed. (Doise-Florida)
W72-06880

DISPOSAL SYSTEMS AND HEARINGS (RELATING TO WATER POLLUTION CONTROL).
South Carolina Pollution Control Authority, Columbia.
For primary bibliographic entry see Field 05G.
W72-06883

WHOSE FISH. WHOSE OCEAN.

Resources, No. 39, p. 17-18, January 1972.

Descriptors: *Fish management, *Law of the sea, *Boundary disputes, *Marine fisheries, *International law, Ownership of beds, Legal aspects, Marine fish, Commercial fish, Oceans, Military aspects, Fish migration, Treaties, Foreign waters, International waters, Relative rights, United Nations, United States, Foreign counties.

Recent encounters between American fishermen and Latin American governments over fishing rights, when coupled with Russian fishing trawlers off our shores, make international resolution of ocean ownership problems necessary. Worldwide fishing interests are more pervasive and important than any other off-shore interests. The main problem is that fish respect no boundaries. In the past 14 years the number of nations claiming fishing limits beyond 12 miles has more than doubled. New institutions and management techniques are needed. One proposed solution is recognition by international agreement of a 'common heritage' to fish in oceans. A United States draft treaty calls for negotiation between coastal states and foreign exploiters, based on respective abilities to exploit. The draft would also preserve military passage rights. The United States draft does not refer to a common heritage, but it effectively recognizes it for such migratory fish as tuna. While the proposal of the United States is unsatisfactory in its treatment of fisheries, it is the only one put forward prior to the 1973 United Nations Conference on the Law of the Sea. Unless more preparation is evident, it may be necessary to postpone the Conference. (Grant-Florida)
W72-06885

CONSERVATIONISTS LOSE FLOOR BATTLE TO AMEND PL-566.
Conservation Report, Report No. 7, p. 69-71, March 3, 1972.

Descriptors: *Watershed Protection and Flood Prevention Act, *Reservoir operation, *Channeling, *Public benefits, *Political aspects, Administrative agencies, Legislation, Watershed management, Federal government, Water management (Applied), Recreation, Reservoir storage, Political constraints, Environmental effects, Federal project policy.
Identifiers: *Fish and Wildlife Coordination Act.

Six thousand water impoundments were constructed under the Watershed Protection and Flood Prevention Act. The public has access to less than 10% of these. Conservationist forces in the House sought to rectify this by an amendment to the Rural Development Bill. Although the Rural Development Bill passed, the amendment to give public access to federally financed reservoirs failed. Another amendment which failed would have provided that the Watershed Protection and Flood Prevention Act be administered in accordance with the Fish and Wildlife Coordination Act. Another amendment which was rejected would have prohibited all location of funds for new stream channelization projects unless the Secretary of Agriculture, the Secretary of Interior, and the Administrator of the Environmental Protection Agency reached agreement that the project was in the public interest. Environmentalists are convinced that the stream channelization issue will remain unresolved as long as it is under the Agricultural Committee's purview. (Brackins-Florida)
W72-06886

HOUSE WATER BILL DUE OUT MARCH 10.

Conservation Report, Report No. 7, p. 63-65, March 3, 1972.

Descriptors: *Legislation, *Industrial wastes, *Water pollution control, *Federal government, *Political constraints, Water pollution, Water Quality Act, Administrative agencies, Permits, Legal aspects, Planning, Federal government, Standards, Regulation, Water quality, Thermal pollution, State governments, Federal Water Pollution Control Act.
Identifiers: *National Environmental Policy Act.

Proposed 1972 House amendments to the Federal Water Pollution Control Act weaken the unanimously passed Senate version. Clean-up requirements beyond 1976 are eliminated. The House bill accepts the Senate's requirement that industry must apply the 'best practicable' control technology by 1976 for minimum compliance with present standards. The Senate bill requires elimination of discharges by 1981, if it is possible at reasonable cost. 1985 is set as a goal for the elimination of all discharges. The House version implements these goals only after a two year feasibility study by the National Academy of Sciences. Charges that Senate goals are likely to cripple industry are examined. Both bills empower the Environmental Protection Agency to establish guidelines for state permits; only the Senate's version authorizes permit vetos by the Agency. The Senate version permits anyone to commence an action against polluters allegedly violating water quality standards. The House version restricts this right. An amendment which attempts to override the court decision requiring the Atomic Energy Commission to examine water quality effects is a nullity, since the Commission is now complying with the decision. (Grant-Florida)
W72-06887

PROBLEMS OF WATER POLLUTION,
Congress, Washington D.C.; and House, Washington, D.C.
W. H. Harsha.
Congressional Record, Vol. 117, No. 178, H 11346-11347 (daily ed.) November 19, 1971.

Descriptors: *Political aspects, *Water pollution control, *Legislation, Planning, Water pollution, Legal aspects, Water quality control, Social aspects, Federal government, Regulation, State governments, Economics, Economic impact, Investigations.

Effective solutions to major pollution problems are necessarily highly complex, involving all levels of government and requiring extremely good intergovernmental relationships. Solutions to pollution problems may have to go to the basic structure of our economic and industrial life, to our technological and scientific capabilities, and must involve an

analysis of environmental goals. Before acting, however, Congress must thoroughly examine several issues. First, fundamental water pollution control goals must be understood. Second, social and economic costs must be weighed. Third, the legislative role must be examined. Fourth, the method of imposing water pollution control requirements must be considered. Finally, the appropriate roles of federal and state governments in the overall pollution control plan must be explored. The Senate has provided answers to many of these questions in a recently enacted bill (S2770). The House Committee on Public Works will conduct hearings in an effort to produce a strong, realistic, and effective water pollution control bill. (Horwitz-Florida)
W72-06890

REQUIREMENT FOR SMALL BUSINESSES TO MAKE WATER POLLUTION IMPROVEMENTS,
Congress, Washington, D.C.; and Senate, Washington, D.C.
J. Sparkman.
Congressional Record, Vol. 117, No. 169, S 17941-17942 (daily ed.) November 9, 1971. 1 tab.

Descriptors: *Loans, *Federal government, *Financing, *Treatment facilities, *Industrial wastes, Economic impact, Political aspects, Pollution abatement, Legal aspects, Legislation, Social impact, Economics, Government finance, Costs, Industry, Industrial production, Industrial plants, Industries, Standards, Water pollution control.
Identifiers: *Small Business Act.

Along with the Federal Water Pollution Control Act Amendments of 1971, the Senate adopted amendment 442. It will allow many small business firms affected by strict new standards of pollution control to make required improvements and remain in business. The amendment would authorize the Small Business Administration to make long-term (up to 30 years) and low-interest loans to small companies forced to augment or improve their plants or facilities. The Small Business Administration would be required to consult with the Environmental Protection Agency and, within six months, publish guidelines and regulations so that funds will be available promptly enough to meet pollution control time requirements. Firms defined as 'small business' will be entitled to loans from the $800 million loan fund created to aid in financing pollution abatement facilities. The amendment can be of great value. A business profile for Alabama is set forth. (Horwitz-Florida)
W72-06891

LIABILITY FOR OVERFLOW OR ESCAPE OF WATER FROM RESERVOIR, DITCH, OR ARTIFICIAL POND,
J. B. Glen.
American Law Reports, Annotated, Vol. 169, p. 517-545, 1947.

Descriptors: *Judicial decisions, *Impounded waters, *Artificial watercourses, *Flood damage, Damages, Drainage districts, Reservoir leakage, Eminent domain, Prescriptive rights, Reservoir operation, Dam failure, Overflow, Washouts, Irrigation ditches, Reservoir construction, Reservoir operation, Surface waters, Impoundments, Adjudication procedure, Legislation, Legal aspects.

Collected and examined in this annotation are case decisions involving theories of absolute liability and liability upon proof of negligence in actions for damages resulting from the escape of impounded or confined waters. The origin of absolute liability for escaping waters is discussed. The doctrine has been successfully asserted in nine states. The overwhelming weight of authority requires liability to be based upon negligence. Under negligence theory the proprietor of impounded waters is not an insurer, but he is liable for negligent construction, maintenance, or operation of the impounding agent. Res ipsa loquitur is applicable, and a proprietor must exercise ordinary or reasonable care. Liability, whether based upon negligence or absolute liability, will not lie for an act of God. Liability may be imposed, however, where negligence is combined with an act of God. There are several possible defenses to damage actions, including: (1) municipal or quasi-municipal immunity, (2) assumption of risk and contributory negligence, and (3) agreements granting immunity from liability. Statutes, affecting the duties of owners of impounded waters, have been held to impose either absolute liability or a higher standard of care. (Blank-Florida)
W72-06892

BOSSE V. KOEHLER (BUILDER'S CONTRACTUAL RESPONSIBILITY TO PROVIDE FRESH WATER WELL).
278 A.2d 602-605 (Md. Ct. App. 1971).

Descriptors: *Maryland, *Potable water, *Water wells, *Construction costs, Legal aspects, Judicial decisions, Damages, Remedies, State governments, Wells, Drilling, Groundwater, Water pollution, Civil law.

Plaintiff homeowners sought to recover from defendant builder the amount paid by plaintiffs for a new well. Plaintiffs had contracted to have defendant build a house with a fresh water well. Although the contract did not mention water supply, defendant conceded the water was intended to be usable. Plaintiffs felt the well water was unsuitable for domestic use. Health department analysis indicated the water at times contained excessive amounts of nitrates. When continued use of the well did not improve the water quality, plaintiffs had a second well drilled. Plaintiffs contended that since defendant implicitly agreed to furnish a well capable of producing usable water, he should bear the expense of the second well. Although defendant admitted he had refused to conduct any further business with the plaintiffs, he contended that he should not be accountable for plaintiffs' unilateral decision to drill a second well. The court, however, held for plaintiffs because they had waited a reasonable period for the first well to work and drilled the second well in good faith. (Horwitz-Florida)
W72-06893

WEST V. BAUMGARTNER (RIGHTS OF GENERAL PUBLIC TO FISH UPON WATERCOURSES WHEN THE BEDS OF SUCH WATERCOURSES ARE PRIVATELY OWNED).
184 S.E.2d 213-224 (Ct. App. Ga. 1971).

Descriptors: *Georgia, *Fishing, *Public rights, *Ownership of beds, State governments, Jurisdiction, Judicial decisions, Legal aspects, Land tenure, Riparian rights, Water law, Beds, Navigable waters, Overlying proprietor, Damages, Remedies.

Plaintiffs sought damages from defendant river bed owners on grounds of false imprisonment and malicious prosecution. While fishing upon waters, the bed of which was owned by defendants, plaintiffs were told they could not fish and were ordered out of the area. Defendants later prosecuted plaintiffs for unlawful fishing. In the action for damages, plaintiffs contended they had a right to fish upon the defendants' waters and that defendants' action were therefore tortious. Defendants claimed that since the state had conveyed the bed of the river to them, the public could no longer fish in those waters. Under Georgia law, the public was held to have the right to fish in all tidal waters whether actually navigable or non-navigable when owned by the state. Furthermore, a grant of the water bed by the state to a private individual will ordinarily not be construed to convey to the public fishing rights unless the intention to do so is so clearly and fully expressed that the grant is incapable of any other reasonable construction. The grant to defendants did not include such exclusive fishing rights. (Horwitz-Florida)
W72-06894

LAVAGNINO V. PORTO-MIX CONCRETE, INC. (PRIVATE REMEDIES UNDER REFUSE ACT).
330 F. Supp. 323-326 (D. Colo. 1971).

Descriptors: *United States, *Rivers and Harbors Act, *Environmental sanitation, *Waste disposal, Colorado, Legal aspects, Water law, Judicial decisions, Jurisdiction, Legislation, Permits, Navigation, Levees, Rivers, Water pollution, Erosion, Water pollution sources, Pollution abatement, Water pollution control, Permits, Wastes, Nonstructural alternatives, Water pollution effects.
Identifiers: *Qui tam actions, *Refuse Act, Standing.

Plaintiff owned land adjacent to a river; the alleged defendant corporations and landowners had caused erosion damage to this land. Plaintiff's claims fell into three categories: (1) he sought to impose the penal sanctions of section 411 of the Rivers and Harbors Act; (2) he sought to collect private damages for alleged violations of the Rivers and Harbors Act, and (3) he sought injunctive relief and damages for the alleged maintenance of a private nuisance. The United States District Court for Colorado granted defendants' motion to dismiss for lack of jurisdiction and failure to state a claim upon which relief could be granted. The Court held: (1) the Rivers and Harbors Act of 1899 gave no right to private individuals to prosecute violations of the Act, even as a qui tam action; (2) private rights of action under the Act were limited to action for injury in the use of navigable waters for the purpose of navigation; and (3) there was no allegation in the complaint giving the court jurisdiction to adjudicate the common law claims of a private nuisance. (Johnson-Florida)
W72-06895

ARON V. CITY OF PHILADELPHIA (INADEQUACY OF MUNICIPAL SEWER IN EXCEPTIONAL INSTANCES).

164 A. 777-780 (1933).

Descriptors: *Pennsylvania, *Storm runoff, *Water injury, *Storm drains, Judicial decisions, Legal aspects, Water law, Cities, Local governments, Closed conduits, Drainage systems, Drains, Storm drains, Storms, Damages, Structures, Floods, Flood control, Runoff, Water control, Rain water.

Plaintiff operated a retail store at the intersection of two streets; the intersection was in a depression. Four times within a two-year period exceptionally heavy rains flooded plaintiff's store because the sewer was not adequate to carry off all the water which flowed into the depression. Plaintiff sued defendant city for alleged negligence in maintaining an inadequate sewage system. Defendant received a judgment non obstante veredicto from the trial court and the Pennsylvania supreme court affirmed the decision. The appellate court held there was no obligation on the city's part to provide sewers of sufficient capacity to carry off, at all times and under all circumstances, all the water. There could be no recovery by the plaintiff unless the inadequacy was due to part of the original drainage scheme not being carried into effect; once the public official had exercised his discretion, the court would not review his decision. The injury suffered by plaintiff resulted from the unfortunate position of his property and not from the negligence of defendant. (Johnson-Florida)
W72-06896

ENVIRONMENTAL DEFENSE FUND, INC. V. CORPS OF ENGINEERS (STANDING OF ENVIRONMENTAL ORGANIZATION TO CONTEST DAM CONSTRUCTION).
325 F. Supp. 728-749 (E.D. Ark. 1971).

Descriptors: *United States, *Environmental effects, *Dam construction, *Adjudication procedure, Project planning, Federal project policy, Federal government, Legal aspects, Administration, Administrative agencies, Judicial decisions, Legislation, Dams, Planning, Water resources development, Decision making, Optimum development plans, Flood control, Contracts.
Identifiers: *National Environmental Policy Act of 1969, *Standing, *Environmental Impact Statements.

Plaintiff conservationists sought an injunction against the contracting of any work by defendant Corps of Engineers in furtherance of a dam construction project. Although construction had not yet commenced, much preparatory work had been completed. Plaintiffs contended that defendants had failed to comply with the requirements of the National Environmental Policy Act of 1969 (NEPA). On a motion to dismiss, defendants argued that plaintiffs lacked standing and that NEPA was not applicable to the project. The United States District Court for the Eastern District of Arkansas held that private membership organizations composed of members with sincere and vital interests in protecting environmental values have standing to contest the construction of a dam by the Corps of Engineers, despite a lack of personal economic interest in the river or adjacent lands. The court also held the NEPA is applicable to a federal agency project regardless of when the project was authorized, how much money had been spent, or the degree of work completed. The court ruled that plaintiffs had failed to state a cause of action by alleging impairment of environmentally related constitutional rights. Defendant's motion to dismiss was rejected, and plaintiffs' application for a preliminary injunction was denied without prejudice. (Johnson-Florida)
W72-06897

SHERIDAN DRIVE ASS'N. V. WOODLAWN BACKPROPERTY OWNERS ASS'N (RIPARIAN RIGHTS OF OWNER OF PROPERTY SEPARATED FROM LAKE BY PUBLIC ROAD).

185 N.W.2d 107-110 (Mich. Ct. App. 1971).

Descriptors: *Michigan, *Riparian rights, *Boundary disputes, *Highways, Riparian lands, Lakes, Boundaries (Property), Legal aspects, Judicial decisions, Lake shores, Public rights, Water rights, Relative rights, Real property.
Identifiers: Injunctions (Prohibitory).

Plaintiff property owners association owned property adjacent to a road along a lake shore, and sought to enjoin defendants, who owned property not adjacent to the road, from trespassing and usurping plaintiffs' riparian rights. Because there was no intervening property between the lake and the road, plaintiffs averred riparian rights in the lake by virtue of ownership of land bordering the road. Whether plaintiffs had riparian rights in this situation constituted the sole issue. The Michigan Court of Appeals, Division Three, held for plaintiffs, stating that an owner of land separated from a lake by only a public road has riparian rights in that lake. If, on the other hand, there is land in private ownership intervening between the road and the lake, riparian rights belong to the owners of such lands and not to the owners of the lands on the opposite side of the road. The Court also stated that the public has riparian rights in a lake at the point where the lake is the terminus of a road. The issuance of an injucnction against defendants was affirmed by the court. (Brackins-Florida)
W72-06898

STURDY HOMES, INC. V. TOWNSHIP OF REDFORD (CONSTITUTIONALITY OF FLOOD PLAIN CONTROL ORDINANCE).

186 N.W. 2d 43-46 (Mich. Ct. App. 1971).

Descriptors: *Michigan, *Flood plain zoning, *Land use, Flood protection, Land development, Public benefits, Legal aspects, Judicial decisions, Local governments, Legislation, Land management, Flood plains, Regulation, Real property.
Identifiers: Constitutional law.

Plaintiff owned land which was zoned as a flood control area. Consequently, plaintiff was denied a building permit to construct a residential house by defendant township. Defendant based its denial of the permit upon its zoning authority, which was based on a flood plain control ordinance. Plaintiff challenged the reasonableness of defendant's decision and the constitutionality of the ordinance which prohibited construction in flood control areas. The Michigan Court of Appeals, Division One, held for the plaintiff on the specific decision but rejected the constitutional attack on the zoning ordinance. The court held that the application of the flood plain ordinance was unreasonable because plaintiff's land had never been flooded, and because plaintiff had built a drainage ditch between his land and the flood area and there was, therefore, no danger to the public health, safety, or welfare. The purposes of the ordinance were, in general, reasonably related to the public health, safety, and welfare. The ordinance was, therefore, held constitutional. (Brackins-Florida)
W72-06899

TESS V. CHARLEROI HOME BUILDING CO. (SURFACE DRAINAGE AND THE DEPOSIT OF SOIL ON NEIGHBOR'S LAND).

96 Pa. Super. 505-510 (1929).

Descriptors: *Pennsylvania, *Land tenure, *Repulsion (Legal aspects), *Erosion control, Real property, Land use, Land, Legal aspects, Judicial decisions, Water law, Drainage water, Riddance (Legal aspects), Surface runoff, Surface waters, Runoff, Erosion, Slopes, Slope protection, Slope stability.

Plaintiff landowner sought to restrain defendant adjoining landowner from allowing soil to wash onto plaintiff's land. Both properties were on a slope. Defendant improved his land on the upper portion of the slope by adding fill to the land. Although no negligence was shown in making these improvements, surface drainage washed deposits of soil onto plaintiff's land. Plaintiff maintained that while a servient owner must accept surface drainage, drainage did not include deposits of soil. Defendant argued that damage done by surface drainage, including deposits of soil, where surface water is diverted without negligence, was damnum absque injuria. The trial court's dismissal of plaintiff's bill was affirmed by the Pennsylvania superior court. Every man has the right to natural, proper, and profitable use of his own land; if in the course of such use without negligence unavoidable loss is brought upon a neighbor, it is damnum absque injuria. (Robinson-Florida)
W72-06900

CRYER V. SAWKILL PINES CAMP, INC. (RIPARIAN RIGHTS IN NON-NAVIGABLE POND).
88 Pa. Super. 71-80 (1926).

Descriptors: *Pennsylvania, *Boundaries (Property), *Ownership of beds, *Riparian rights, *Non-navigable waters, Boundary disputes, Land tenure, Judicial decisions, Legal aspects, Water law, Water rights, Damages, Remedies, Adjudication procedure, Ponds, Farm ponds, Relative rights.

Plaintiff landowner sued defendant landowner for trespass upon his non-navigable pond. Defendant's deed described the boundary of his land as the bank of plaintiff's pond, and it granted defendant the privilege of watering cattle at the pond. A dock and a raft were built on the pond by defendant, and rowboats were also placed on the pond. Defendant maintained that ownership of the bordering land implied title to the center of the pond, and that the privilege of watering cattle justified his actions. The Pennsylvania Superior Court ruled that the right to water cattle, granted in a deed, does not justify the construction or use of a dock or raft. Moreover, the court held that where a deed describes the boundary to property as along a pond, the grantee's title does not extend to the center of a non-navigable pond. Judgment for plaintiff was affirmed. (Robinson-Florida)
W72-06901

UNDERWOOD V. HILL (LIABILITY FOR OBSTRUCTING NATURAL FLOW OF STREAM).
10 Tenn. App. 608-621 (1929).

Descriptors: *Tennessee, *Streams, *Obstruction to flow, *Natural flow doctrine, *Dam construction, Dams, Adjudication procedure, Damages, Water injury, Crops, Farms, Legal aspects, Judicial decisions.

Plaintiff landowner sued defendant adjacent landowner to recover damages resulting from the diversion of a stream traversing both properties. Defendant constructed a wire fence across the stream, creating an obstruction which caused the stream to divert and wash a new channel in plaintiff's land. Defendant, however, set up res judicata as a defense, stating he had recovered damages from plaintiff for diversion of the same stream when it was dammed by plaintiff. Plaintiff later constructed a second dam and, when he was enjoined to remove his dams, plaintiff appealed contending the dams were erected in response to stream obstruction by defendant. The Tennessee Court of Appeal held the plea of res judicata ineffectual against the case involving plaintiff's second dam, and stated that neither party could insist upon adjustment of damages from the first suit. Plaintiff claimed the lower court erred in finding that defendant had not obstructed the stream before the dams were built. The court, however, held that the finding was sustained by the evidence, thus affirming the lower court's decree enjoining plaintiff to remove his dams and defendant to remove any obstruction which might exist in the stream. (Hart-Florida)
W72-06902

COLLINS V. COSGROVE-MEEHAN COAL CO. (MINING COMPANY'S LIABILITY FOR FLOODING FARM WITH COAL MINE WASTES).
279 Ill. App. 98-102 (1935).

Descriptors: *Illinois, *Mine water, *Mine drainage, *Coal mine wastes, *Flood damage, Ditches, Mine wastes, Coal mines, Farms, Damages, Water injury, Adjudication procedure, Legal aspects, Judicial decisions.

Plaintiff farmowner sued to recover for flood damages from defendant coal mining company. Plaintiff had previously given written consent for defendant to divert its waste mine water through a natural watercourse on his farm, provided the water was confined to the channel. When the ditch filled with sediment from mine water and overflowed, the land was covered with copperas which killed vegetation. Defendant's contention that plaintiff could not recover because of the written consent was rejected by the Illinois Court of Appeal, because defendant exceeded the authority granted by plaintiff. Defendant also contended the lower court improperly permitted evidence on the measure of damages for permanent injury. Since the testimony presented at trial respecting the permanence of the mineral damage to cultivation was vague and nebulous, the court held it did not support a determination that the overflow caused permanent injury. Accordingly, the case was remanded for a new trial on the issue of damages. (Hart-Florida)
W72-06903

MEREDOSIA LAKE DRAINAGE AND LEVEE DIST. V. SANITARY DIST. OF CHICAGO (LIABILITY OF SANITARY DISTRICT FOR OVERFLOW OF RIVER LEVEES).
268 Ill. App. 93-125 (1932).

Descriptors: *Illinois, *Drainage districts, *Cities, *Municipal wastes, Flood damage, Lake Michigan, Rivers, Navigable rivers, Levees, Dikes, Waste dilution, Waste treatment, Sewage disposal, Flood protection, Discharge (Water), Flood control, Water injury, Legal aspects, Judicial decisions.

Plaintiff drainage district sued defendant sanitary district to recover damages from surface water overflow. Plaintiff contended that defendant had discharged excessive water into the Illinois River, causing it to overflow and flood plaintiff's land. Defendant diverted water from Lake Michigan and the Chicago River to dilute municipal sewage from Chicago. The quantity of water authorized for diversion was directly proportional to Chicago's population. Defendant contended that plaintiff's action was barred because it was based upon a permanent injury arising more than five years before initiation of the suit, thus falling outside the five year statute of limitations. Plaintiff alleged the injury was only temporary and recurring; thus, a new cause arose periodically, disengaging the statute of limitations. The Illinois Appellate Court determined that the cause alleged permanent injury because plaintiff's levees and dykes were washed away, and the ditches were enlarged by the floodwaters. Hence, the court held that plaintiff's action was barred by the statute of limitations. (Hart-Florida)
W72-06904

OUR MARINE HERITAGE,
National Council on Marine Resources and Engineering Development, Washington, D.C.
E. Wenk, Jr.
In: Proceedings of the 14th Southern Water Resources Conference, Miami Beach, Florida, July 31-August 2, 1968. p 3-12.

Descriptors: *Coasts, *Oceans, *Environmental effects, *Land development, *Political constraints, Beaches, Shores, Coastal plains, Coastal marshes, Administrative agencies, Industrial wastes, Water quality control, Pollution abatement, Water policy, State governments, Federal government.
Identifiers: Clean Water Restoration Act.

Comparatively little is known about the vast coastal zones of the world, yet these ecologically fragile areas are subject to enormous pressure and conflicting uses. The problems of coastal zones are discussed in terms of the national program of the marine sciences and the political institutions needed to harness science and technology. The concern of various federal agencies is detailed, along with the interrelated role of the Marine Sciences Council. The Council is not an operating agency. Its job is to serve as a coordinator and channel of communications foreleven federal agencies and between the federal government and the states. The accomplishments of the Council are examined. Dynamic conservation is discussed in conjunction with some initial steps such as the Clean Water Restoration Act of 1966 and cooperation between the Department of Interior and the Corps of Engineers. The need for greater federal-state cooperation is detailed. Future actions should be aimed at developing increased public awareness and an integrated program of science, technology, and public administration. Five recommendations are made: (1) coastal zoning, (2) water quality as a zoning criterion, (3) land acquisition programs, (4) regional coastal planning, and (5) increased scientific and engineering studies. (Grant-Florida)
W72-06905

PUBLIC LANDS--ACCRETION OR AVULSION--DEFENSES.

Public Law No 91-505, 84 Stat. 1106, 13 U.S. Code Cong. and Admin. News, p 5117-5118 (1970).

Descriptors: *Real property, *Accretion (Legal aspects), *California, *Avulsion, Land tenure, Legislation, Judicial decisions, Legal aspects, Water law, Boundaries (Property), Federal government, Political aspects, Colorado River, Interstate compacts, Federal reservations, Public lands.
Identifiers: Riverside County (Calif).

When the United States seeks to establish title to land it shall be subject to all legal and equitable defenses available against a private party litigant under the laws of the state in which the subject property is situated. The following facts must also be present: (1) such title or ownership must be claimed on the basis of accretion or avulsion, (2) the lands are not necessary for riparian frontage to other federal lands, (3) the facts upon which the United States bases its claims occurred more than forty years prior to this Act, (4) the defendant has paid real property taxes on the disputed lands, (5) defendants claim title on the basis of accretions to lands having chains of title derived from the state or federal government, and (6) a reasonably prudent man would have believed that he obtained title free of any claim. This Act only applies to certain lands in Riverside County, California within three miles of the Colorado River. The Act applies retroactively unless the action has been concluded by a final court determination. (Robinson-Florida)
W72-06906

CANADA'S INTERNATIONAL WATERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
A. T. Prince, and R. H. Clark.
Technical Bulletin No 53, 1971. 9 p, 5 ref.

Descriptors: *International waters, *Boundaries (Property), *Great Lakes, *Rivers, Inter-agency cooperation, Lakes, Streams, Surveys, Planning, Boundary disputes, St. Lawrence River, Negotiations, Water management (Applied), Water values, Water users.
Identifiers: *Canada, Boundary Waters Treaty, Canada Water Act.

The international arrangements made for the study and utilization of a few of the major 'international waters' are outlined. These waters are defined as the rivers crossing the boundary between Canada and the United States, as well as those bodies of fresh water through which the boundary passes. The international boundary is about 5,000 mi, including 2,200 mi of rivers and lakes. About 300 streams, rivers and lakes are along the boundary. The International Joint Commission, established under the Boundary Waters Treaty of 1909 as a permanent tribunal, has the essential role of seeking solutions to water conflicts. Examples are given of problems and studies before the Commission. Development of the Canada Centre for Inland Waters, which is administered by the Department of the Environment, is explained and its concept and plan defined. The Canada Water Act provides the framework to the Department for planning and development on interjurisdictional and international waters, and to complement studies being made under the Boundary Waters Treaty. (Lang-USGS)
W72-06925

ENVIRONMENTAL QUALITY AS AN ADMINISTRATIVE PROBLEM,
Indiana Univ., Bloomington.
L. K. Caldwell.
The Annals of the American Academy of Political and Social Science, Vol 400, p 103-115, March 1972. 5 ref.

Descriptors: *Environment, *Quality control, *Administration, Planning, Decision making, Control, Governments, Resources, Pollution abatement, Deterioration, Synthesis, Values, Structures.
Identifiers: *Environmental quality, Governmental reorganization, Resource depletion.

The basic task of protection and control of environmental quality involves the integration of man's artificial and managed systems with the evolved systems of the natural world. Imbalances and incongruities among these systems are the underlying causes of resource depletion, pollution, and qualitative deterioration of the environment. The essential purpose of environmental administration is therefore to obtain a synthesis of artificial and natural systems that will simultaneously serve man's needs and values, and maintain the life-support systems of the biosphere upon which man's welfare and survival ultimately depend. New structures and procedures of planning and control appear to be inevitable if contemporary man is to deal effectively with the circumstances that he has himself created. But governmental reorganization cannot safely be undertaken solely with respect to environmental needs. Provision for meeting the environmental challenge, if it is to be effective, must be made within the context of the broad range of issues and problems confronting contemporary society. (Strachan-Chicago)
W72-06943

CONFLICTS IN WATER RESOURCES PLANNING.
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 06B.
W72-06958

A SEARCH FOR GOALS IN WATER RESOURCES PLANNING,
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 06B.
W72-06959

THE URGENCY OF STANDARDIZED GOVERNMENTAL POLICY FOR WATER RESOURCE DEVELOPMENT,
Texas State House of Representatives, Austin.
For primary bibliographic entry see Field 06B.
W72-06964

KESSINGER V. STANDARD OIL CO. (UPSTREAM RIPARIAN'S LIABILITY FOR DISCHARGING SILT INTO RIVER).

245 Ill. App. 376-383 (1925).

Descriptors: *Illinois, *Permits, *Mississippi River, *Navigable rivers, Sands, Dredging, Channel improvement, Desilting, Rivers, Riparian waters, Silts, Damages, Administrative agencies, Legal aspects, Judicial decisions, Adjudication procedure, Riparian rights.

Plaintiff sand company sued defendant oil company for damages from injury to its sand dredging business. Plaintiff was engaged in dredging sand from the Mississippi River. Defendant owned land on a stream which discharged into the Mississippi River about 3/4 of a mile above plaintiff's dredging operation. Defendant dredged and cleaned out the stream. This caused large quantities of mud and silt to flow into the Mississippi and ruin plaintiff's dredging activities. Plaintiff sought lost profits. The Illinois appellate court ruled that: (1) sand may not be taken from a navigable stream without the consent of the Secretary of War; (2) an action by a riparian owner will lie, except against the federal government, to enjoin the excavation and removal of sand from the bed of a navigable stream. The court held that it would not lend aid to an illegal act, and it reversed the lower court's judgment for plaintiff. The court also rejected

plaintiff's assertion that defendant was estopped from raising the absence of a permit because defendant had also violated the law by discharging silt and purchasing sand from plaintiff. (Hart-Florida)
W72-07181

CONNER V. CITY OF SPENCER (LIABILITY FOR DAMAGES TO SPRING FROM ROAD IMPROVEMENTS).
176 S.E. 858-859 (W. Va. 1934).

Descriptors: *West Virginia, *Damages, *Water pollution sources, *Spring waters, *Road construction, Cities, Judicial decisions, Legal aspects, Water law, Remedies, Water pollution, Springs, Seepage, Water pollution effects, Groundwater, Waste water (Pollution), Surface runoff, Sewage, Roads, Road design, Local governments, Adjudication procedure, Percolating water.

Plaintiff landowner sued defendant city for damages to a spring on his property. Plaintiff alleged that the spring had been ruined by the city's improvement of an adjacent street. The improvements opened the strata on the upper side of the spring allowing seepage of sewage and groundwater into the spring. Defendant city maintained that this condition existed before the street was improved. The jury rendered a verdict for the plaintiff, but the trial court granted defendant's motion for a new trial on the basis that the injury to the spring was merely temporary. The Supreme Court of Appeals of West Virginia reversed and reinstated the verdict. The court held that when a spring is impaired by the seepage of surface water and other substances as a result of durable construction by a municipality, resulting damages are permanent and not temporary. (Robinson-Florida)
W72-07182

NEESE V. CITY OF ATLANTA (CITY'S LIABILITY FOR INADEQUATE DRAINAGE SYSTEM).
165 S.E. 165-167 (Ct. App. Ga. 1932).

Descriptors: *Georgia, *Cities, *Drainage systems, *Administrative decisions, Drainage, Sewers, Storm drains, Storm runoff, Legal aspects, Judicial decisions, Drainage water, Local governments.

Plaintiff landowner sued defendant city for damages from flood injury. Plaintiff contended that defendant had negligently constructed storm drains of an inadequate size and improperly located drains. The Georgia Court of Appeals, Division One, noted that a municipality is not liable for an error in judgment in locating and planning a drainage system. The court held that plaintiff could not recover from defendant because the municipal drainage system was too small to carry off natural water flow. The court noted that the location and planning of drainage improvements was a quasi-judicial function of municipal authorities. (Hart-Florida)
W72-07183

CITY OF ALBANY V. SIMON (CITY'S LIABILITY FOR DRAINAGE OF SURFACE WATER ONTO ANOTHER'S LAND).
136 S.E. 100-101 (Ct. App. Ga. 1926).

Descriptors: *Georgia, *Riddance (Legal aspects), *Storm runoff, *Storm drains, Flood damage, Cities, Judicial decisions, Legal aspects, Water law, Floods, Rain, Rain water, Overland flow, Drainage, Water, Drains, Drainage engineering, Drainage systems, Surface waters, Surface runoff, Floodwater.

Plaintiff landowner sued defendant city for damages resulting from the inundation of property. Defendant's grading of certain streets caused rain water to collect in large quantities on the street adjacent to plaintiff's property. To alleviate this situation, defendant inserted a drain on the street. Water was thereby drained onto the plaintiff's property. Defendant demurred to the complaint. Defendant's demurrer was overruled by the trial court. The Court of Appeals of Georgia, Division One, affirmed on grounds that there was ample evidence to show that plaintiff was damaged by defendant's installation of the drain. (Robinson-Florida)
W72-07184

CITY OF MACON V. MACON PAPER CO. (CITY'S LIABILITY FOR INADEQUATE DRAINAGE SYSTEM).
132 S.E. 136 (Ct. App. Ga. 1926).

Descriptors: *Georgia, *Flood damage, *Surface runoff, *Drainage systems, Cities, Legal aspects, Water law, Judicial decisions, Floods, Overflow, Overland flow, Precipitation (Atmospheric), Rain, Rain water, Runoff, Water injury, Drainage, Water control, Drainage water, Drains.

Plaintiff landowner sued defendant city for damages resulting from the flooding of his property. Although the city's drainage system was adequate when installed, new buildings and paved roads had reduced the effectiveness of the system to the point where water accumulated from even ordinary rainfalls. The plaintiff alleged that the system had become a nuisance. The trial court overruled defendants demurrer; and, subsequently the appeals court held that when a city knows its drainage system has become inadequate, its maintenance thereafter constitutes a nuisance, with the city being liable for resulting damages. (Robinson-Florida)
W72-07185

ELLER V. CITY OF GREENSBORO (CITY'S LIABILITY FOR DISCHARGE OF SURFACE WATER ONTO ANOTHER'S LAND).
130 S.E. 851-854 (NC 1925).

Descriptors: *North Carolina, *Damages, *Flood damage, *Surface runoff, Judicial decisions, Legal aspects, Water law, Cities, Remedies, Floods, Water injury, Erosion, Floodwater, Runoff, Discharge (Water), Surface drainage, Drainage water, Drainage systems, Drainage engineering, Drainage, Drains, Engineering, Civil engineering.

Plaintiff landowner sued defendant city for damages from the diversion, concentration, and discharge of surface waters onto his property. Plaintiff's lot was eroded, his cellar flooded, and his home undermined. Plaintiff alleged that the city owed him a duty not to pave and grade streets in a manner which would concentrate surface water on the plaintiff's land. Defendant denied breaching this duty. The trial court held for plaintiff. The North Carolina supreme court affirmed. The court determined that a city is liable for negligence when it fails to exercise ordinary skill and caution in constructing artificial drains. Damages for a permanent injury equal the difference between the value of the property before and after the complained of acts. (Robinson-Florida)
W72-07186

CLARKE V. ACKERMAN (JURISDICTION OF NEW YORK OVER HUDSON RIVER).
243 App. Div. 446, 278 N.Y.S. 75-80 (1935).

Descriptors: *New York, *New Jersey, *State jurisdiction, *Treaties, Bridges, Hudson River, Navigable rivers, Boundaries (Property), Boundary disputes, Legal aspects, Judicial decisions.

Plaintiff motorcyclist sued defendant New Jersey motorist for damages in tort resulting from an auto accident on the George Washington Bridge. Plaintiff attempted to obtain 'long-arm' jurisdiction over defendant by the New York statute. According to one section of the 1834 New York-New Jersey treaty, the accident occurred on the New Jersey side of the bridge. However, another section of the treaty provided that New York would have exclusive jurisdiction respecting the waters of the Hudson River, subject to certain inconsequential exceptions. Plaintiff therefore contended that jurisdiction was properly obtained over defendant. Nevertheless, the New York supreme court construed the latter treaty provision to apply only to police jurisdiction over the Hudson River, concluding that New Jersey had not given up sovereignty over its portion of the river. Hence the court held that jurisdiction was not obtained. (Hart-Florida)
W72-07187

KLEIN V. TOWN OF PITTSTOWN (LIABILITY OF TOWN FOR REMOVING EMBANKMENT, CAUSING FLOOD).
241 App. Div. 202, 272 N.Y.S. 324-327 (1934).

Descriptors: *New York, *Cities, *Floods, *Damages, Cloudbursts, Dam failure, Flood protection, Rain, Rain water, Water injury, Flood damage, Judicial decisions, Legal aspects.

Plaintiff landowner sued defendant municipality for damages from a flood. Plaintiff's land was adjacent to a road. Land on the opposite side was higher than plaintiff's. To prevent water from flowing from the higher land, across the road, and onto his land, plaintiff erected an 18-inch embankment next to the ditch on his side of the road. The road was washed out by a heavy rain; defendant removed plaintiff's embankment while making repairs. Removal of the embankment allowed plaintiff's land to be flooded during the next heavy rain. Plaintiff contended defendant was liable for his flood injury. However, since defendant had no duty to maintain the embankment, the New York supreme court held defendant was not liable for plaintiff's flood damage. (Hart-Florida)
W72-07188

HANSON V. CITY OF MONTEVIDEO (FLOOD DAMAGE RESULTING FROM EXTRAORDINARY RAINFALL).
249 N. W. 46-47. (Minn 1933).

Descriptors: *Minnesota, *Flood damage, *Storm runoff, *Storm drains, Judicial decisions, Legal aspects, Water law, Flood control, Drainage systems, Flash floods, Flood protection, Overflow, Floods, Precipitation (Atmospheric), Rain, Rain water, Runoff, Storms, Surface runoff, Water injury, Surface drainage, Engineering structures, Sewers, Cities, Drainage engineering.

Plaintiff landowner sued defendant city for damages resulting from the flooding of his property. The city had installed two new drainage outlets in the vicinity of plaintiff's property. However, in preparation for street improvements, the city also spread a windrow of gravel along the street. That night the most intense rainfall ever recorded in the city occurred, sweeping the gravel and other debris onto the drains. This clogged the drains, causing an overflow which subsequently flooded plaintiff's property. Plaintiff alleged that the city was negligent in construction of the sewer drains. The trail court granted a judgment notwithstanding the verdict on motion by the defendant city. The Supreme Court of Minnesota affirmed, finding the city had not failed to exercise reasonable care and skill. A city is not held responsible for the results of a rainfall that is unusual, extraordinary, and one that cannot reasonably be anticipated. (Robinson-Florida)
W72-07189

STATE V. DOVE (STATE'S POWER TO EXERCISE JURISDICTION OVER LAKE UNTIL TREATY BECOMES OPERATIVE).
236 N.W. 322-324 (Minn 1931).

Descriptors: *Minnesota, *International law, *Treaties, *Fishing, Federal government, Judicial decisions, Water law, Legal aspects, Nets, Fish, Water utilization, Lakes, Lake fisheries, Surface waters, Boundaries (Property), Law enforcement, Governmental interrelations.

The State of Minnesota prosecuted the defendant for fishing with gill nets 2,500 feet south of the boundary line established in Rainy Lake by joint action between the United States and Canada. Defendant contended that the Webster-Asburton Treaty and the Root-Bryce Treaty terminated Minnesota's jurisdiction over fishing in this area and vested it in the International Fisheries Commission. However, no regulations had been proclaimed placing the International Fisheries Commission into operation. The trial court convicted the defendant. The Minnesota supreme court affirmed. Fishing in Rainy Lake on the Minnesota side of the Canadian border remained under state control until the International Fisheries Commission began to function. (Robinson-Florida)
W72-07190

CALVERT CLIFFS' COORDINATING COMM, INC. V. ATOMIC ENERGY COMM. (FULL CONSIDERATION OF ENVIRONMENTAL EFFECTS IN ADMINISTRATIVE DECISION MAKING).
1 Environmental Law Reporter 20346-20357 (D.C. Cir. July 23, 1971).

Descriptors: *United States, *Environmental effects, *Nuclear powerplants, *Administrative decisions, Project planning, Judicial decisions, Legal aspects, Legislation, Administration, Adjudication procedure, Federal government, Administrative agencies, Regulation, Environment, Ecology, Nuclear wastes, Thermal pollution, Construction, Planning, Operations, Permits.
Identifiers: *National Environmental Policy Act.

Petitioners attacked certain procedural rules of respondent Atomic Energy Commission as being violative of the National Environmental Policy Act of 1969 (NEPA). Prior to NEPA, respondent had failed to concern itself with the adverse environmental effects of the facilities which it licensed. Petitioners argued that respondent's new procedures for considering environmental effects failed to meet the mandate imposed by NEPA. The Court of Appeals for the District of Columbia Circuit ruled that: (1) NEPA imposes an affirmative duty to consider environmental values at every stage of the decision-making process, including hearing board review; (2) environmental factors must be taken into account to the fullest extent possible, from the time that the Act went into effect; (3) each federal agency must assess the complete environmental costs of its actions on a case-by-case basis; and (4) the duty to fully consider action which will avoid environmental degradation includes an immediate review of prior actions where a future permit will be required for operating the approved facility. The court found that respondent's rules did not comply with NEPA and remanded the rules for further consideration by respondent. (Johnson-Florida)
W72-07191

KEMP FEDERAL WATER POLLUTION CONTROL BILL,
Congress, Washington, D.C.; and House, Washington, D.C.
J. F. Kemp.
Congressional Record, Vol 118, No 24, H1310-1315 (daily ed.) February 22, 1972. 4 tab.

Descriptors: *Water pollution control, *Legislation, *Federal government, *Water quality standards, Project planning, Legal aspects, Standards, Permits, Political aspects, Waste treatment, Recreation, New York, Water quality control, Government finance, Grants, Loans, Industrial wastes, Treatment facilities, Pollution abatement, Regulation, Administration, Administrative agencies.

Introduced by Mr. Kemp, the House version of an amendment to the Water Pollution Control Act has two stages. During the first phase ending in 1976, companies must apply the best practicable technology to control water pollution. In the second stage, companies must achieve zero discharge by 1981, unless they can show that it cannot be done at a reasonable cost. The objective is to achieve water clean enough for swimming and fish propagation by 1981, and to eliminate all effluents by 1985. If the cost of zero discharge proves too great Congress may reconsider this goal in 1976. The Environmental Protection Agency is required to establish standards of performance to reflect the maximum reduction of pollutants possible through the use of the best available control technology. By requiring firms to achieve zero discharge unless they can factually show that the goal cannot be reached at reasonable cost, the bill shifts the burden of proof from the government to the polluter. A detailed study by the New York Department of Environmental Conservation is included. The study examines House, Senate, and Administration water pollution control bills in terms of their effect on pending projects in New York. (Horwitz-Florida)
W72-07192

REFUSE ACT PERMIT PROGRAM.
Congress, Washington, D.C.; and Committee on the Environment (U. S. Senate).
For primary bibliographic entry see Field 05G.
W72-07193

A REGULATION REQUIRING THE SUBMISSION OF ENGINEERING REPORTS AS A PART OF APPLICATIONS FOR THE DISCHARGE OF SEWAGE AND/OR INDUSTRIAL WASTES AND FOR THE CONSTRUCTION OR ALTERATION OF TREATMENT WORKS OR OUTLETS OR FOR THE INCRE ASE OF LOAD THROUGH EXISTING TREATMENT WORKS OR OUTLETS.
South Carolina Pollution Control Authority, Columbia.
For primary bibliographic entry see Field 05G.
W72-07194

ENFORCEMENT OF ENVIRONMENTAL LAW ON THE LOCAL LEVEL,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 05G.
W72-07195

MENZER V. VILLAGE OF ELKHART LAKE (POWER OF LOCAL GOVERNMENT TO REGULATE BOATING ON NAVIGABLE LAKE).

186 N.W.2d 290-298 (Wis. 1971).

Descriptors: *Wisconsin, *Boating regulations, *Navigable waters, *Local governments, *Lakes, Legislation, Public health, Legal aspects, Judicial decisions, Bodies of water, Recreation, Safety, Ownership of beds, Public rights, Boating, Cities.
Identifiers: *Public trust doctrine.

Plaintiff landowner sued to have defendant city's ordinance prohibiting the operation of power boats on a navigable lake declared invalid. Plaintiff contended that defendant had no authority to regulate boating on navigable waters. Defendant contended that Wisconsin statutes, section 30.77, conferred such power. The Wisconsin supreme court held that cities are statutorily authorized to regulate the use of boats in the interest of public health and safety, so long as such regulations are not inconsistent with state statutes. The court ruled that defendant's ordinance was local in scope and, therefore, permissible. The questioned relationship between the ordinance and the public health and safety raised a material question of fact to be determined at trial. The court held further that the public trust doctrine, by which the state exercised control over navigable waters, was not abdicated by delegation of limited power to cities, but was enhanced where local conditions required regulation. The court suggested that a sharper legislative delineation of the area subject to local regulation would be desirable. (Grant-Florida)
W72-07196

TEXACO, INC. V. HICKEL (VALIDATION OF STATE LEASE EXISTING BEFORE SUBMERGED LANDS ACT).

437 F.2d 636-646 (D.C. Cir. 1970).

Descriptors: *Submerged Lands Act, *Leases, *Oil wells, *State jurisdiction, Federal jurisdiction, Continental shelf, Administrative decisions, Administrative agencies, Legal aspects, Judicial decisions, Legislation, Oil fields, Oil, State governments, Federal government, Oil industry.
Identifiers: *Outer Continental Shelf Lands Act.

Petitioner oil company sought to compel respondent Secretary of the Interior to issue a drilling permit within an offshore oil lease granted by Louisiana in 1936 and validated in 1958 under the Submerged Lands Act as an historical lease of submerged lands. The seaward boundary of the lease was Louisiana's territorial limit, which at the time of the lease was in good faith believed to be three leagues from land. The Act fixed the maximum limit of an historical boundary at three leagues from the coastline. Respondent denied petitioner's drilling request on grounds that the proposed drilling site was seaward of three leagues from the historical baseline of the Louisiana lease, as established in 1958. Petitioner contended that the coastline was construed to be the salient points line, which would place the drilling site within three leagues. The court held that the 1958 proceeding had not established the actual historical baseline. It had merely validated the historical lease and set its outer limit. Consequently, the denial of the permit was held unjustified, and petitioner was entitled to a de novo determination by respondent as to the appropriate historical baseline. (Grant-Florida)
W72-07197

PARKLAWN, INC. V. GIANT FOOD, INC, (RIGHT TO STOP FLOODING OF PROPERTY DUE TO IMPROPER DRAINAGE OF UPPER LANDOWNERS PROPERTY).

277 A.2d 80-84 (Ct. App. Md. 1971).

Descriptors: *Drainage effects, *Damages, *Land tenure, *Maryland, Construction, Legal aspects, Remedies, Local governments, Judicial decisions, Erosion, Drainage water, Drainage, Drainage systems, Streams, Building codes, Adjacent landowners, Topography.

Plaintiff lower landowner sought both damages for prior flooding of its cemetery and an injunction to force defendant upper landowner to improve drainage from its lands. After the defendant constructed a shopping center, the stream which flowed through defendant's land onto plaintiff's land periodically overflowed. Each time the stream overflowed excessive water, silt, debris, and dirt was deposited on plaintiff's cemetery. Plaintiff contended that the flooding was caused by improper drainage facilities for defendant's shopping center as well as erosion from a vacant lot owned by defendant. Plaintiff alleged that defendant was negligent in maintaining the vacant lot and that the drainage system of the shopping center constituted a private nuisance. Defendant contended that since the land was developed in compliance with local ordinances, no liability existed for the periodic overflow. Plaintiff was allowed to recover for past damages to the cemetery

and to obtain an injunction forcing defendant to take corrective action. (Horwitz-Florida)
W72-07198

UNITED STATES V. PENNSYLVANIA INDUSTRIAL CHEMICAL CORP. (CONSEQUENCES OF GOVERNMENT'S FAILURE TO ESTABLISH REFUSE ACT PERMIT PROCEDURES).
329 F. Supp. 1118-1124 (W.D. Pa. 1971).

Descriptors: *United States, *Chemical wastes, *Rivers and Harbors Act, *Water Quality Act, *Pollution abatement, Permits, Standards, Federal government, Judicial decisions, Legislation, Administrative agencies, Legal aspects, Regulation, Adjudication procedure, Sewage, Industrial wastes, Effluents, Water pollution sources, Waste disposal, Water quality control, Environmental engineering, Water quality standards.

Defendant corporation was indicted and tried on four counts of discharging chemical effluents into the Monongahela River in violation of the Rivers and Harbors Act of 1899. Prior to the verdict, defendant moved for a judgment of acquittal. Defendant contended that: (1) pipes carrying the effluent were sewers and discharges from sewers were exempted from the Act, (2) enforcement of the Act was estopped by the government's failure to establish permit procedures, and (3) the discharge did not violate state water quality standards and therefore the Act was not violated. The United States District Court for the Western District of Pennsylvania held that: (1) the Rivers and Harbors Act exempts only 'sewage', not all matter flowing in a liquid state from an underground conduit; (2) dischargers must make application for a permit, the government has no duty to solicit applications; and (3) prohibitions of the Rivers and Harbors Act are not affected by provisions of the Water Pollution Control Act dealing with water quality standards. Defendant's motion for acquittal was denied. (Johnson-Florida)
W72-07199

GENERAL DESIGN CRITERIA FOR NUCLEAR POWER PLANTS,
Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-07200

BOROUGH OF AMBLER V. SHEPHERD (DUTY OF MUNICIPALITY TO MAINTAIN STREAMFLOW IN STREAM USED TO CARRY THE MUNICIPAL SEWAGE).
For primary bibliographic entry see Field 05G.
W72-07201

RECENT CASES OF WATER-UTILITY LIABILITY,
National Inst. of Municipal Law Officers, Washington, D.C.
B. W. Rhyne.
Journal American Water Works Association, Vol. 64, p. 82-87, February 1972. 3 photo.

Descriptors: *Public utilities, *Water distribution (Applied), *Judicial decisions, *Municipal water, Water supply, Cities, Legal aspects, Structures, Conduits, Local governments, Institutional constraints, Standards, Water policy, Water distribution (Policy), Water conveyance, Water delivery, Public utility districts, Water works.
Identifiers: *Sovereign immunity, Absolute liability.

Generally, water utilities are liable for negligent acts. This applies to a municipally owned utility, but only in its proprietary role. The governmental functions of water utility operation are exempted from liability under the sovereign immunity doctrine. For some acts strict liability is imposed, for other negligence must be proven. The validity of contracts against liability is discussed. Illustrative cases of liability and nonliability are provided. Generally, the defense of sovereign immunity is available in cases arising out of fire protection services, but this rule is undergoing change in some states. A utility operator is generally liable for contamination of a water supply. Liability for injury caused by structural defects usually depends upon who has control over the item. Cases in conflict on this point are discussed. Cases frequently involve water mains. Generally, sovereign immunity is inapplicable and negligence must be shown. There is, however, a tendency toward strict liability. Some courts apply the 'escaping substances' doctrine of Rylands v. Fletcher to damage caused by broken mains. Cases are discussed to show what considerations are involved in proving negligence. (Grant-Florida)
W72-07202

SCHWING V. CITY OF BATON ROUGE (COMPENSATION FOR THE TAKING OF RIPARIAN RIGHTS).

249 So.2d 304-310 (La. Ct App. 1971).

Descriptors: *Louisiana, *Condemnation value, *Eminent domain, *Riparian rights, Zoning, Judicial decisions, Legal aspects, Local governments, Jurisdiction, Public rights, Building codes, Land tenure, Cities, Land use, Project planning.

In a case involving an appeal of a refusal to resubdivide land, the Court of Appeal of Louisiana, First Circuit, stated that only rights under a riparian servitude may be taken for public use without just compensation. This single exception was modified by the 1921 Louisiana constitution to require payment of the assessed value for the prior year. The court noted that the legislature intended to regard riparian servitude as a special case, with all other servitudes, such as those for streets, requiring just compensation to be paid the owner for his loss. (Horwitz-Florida)
W72-07203

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1971.
Congress, Washington, D.C.; and Senate, Washington, D.C.

Congressional Record, Vol. 117, No. 164, S 17424-17486 (daily ed.) November 2, 1971.

Descriptors: *Legislation, *Standards, *Treatment facilities, *Federal Water Pollution Control Act, Effluents, Water pollution control, Water purification, Sewage treatment, Federal government, Permits, Regulation, Legal aspects, Administration, Grants, Projects, Research and development, Loans, Education, Training, Navigable waters, Costs, Government finance.
Identifiers: Environmental Protection Agency.

The bill's objective is elimination of effluents in navigable waters by 1985, with an intermediate goal of 1981. The Environmental Protection Agency, in cooperation with the states, is to devlop comprehensive programs of research and control for elimination of pollution in navigable waters. A broad program of training grants, scholarships, and demonstrations is authorized. States and municipalities are permitted grants to assist in construction of better pollution control and treatment facilities. Effluent discharges are unlawful except as provided in the bill. Point source discharges are to be unlawful by 1976, except for publicly owned treatment works, which will conform to the best practicable control technology. After 1981 public discharges must cease unless the Administrator finds the cost unreasonable. The bill also provides liability provisions for oil discharges, standards for sanitation devices on vessels, prerequisites for securing a federal permit, emergency powers to abate pollution which threatens imminent danger to health or welfare of persons, and citizen suits to enforce standards. Several advisory boards are created. (Grant-Florida)
W72-07204

ENVIRONMENTAL LAW--WATER RESOURCES--ZONES OF SHARED CONSERVATION AUTHORITY AND UNITED STATES PUBLIC POLICY,
For primary bibliographic entry see Field 05G.
W72-07205

POWER AND THE ENVIRONMENT: A STATUTORY APPROACH TO ELECTRIC FACILITY SITING,
For primary bibliographic entry see Field 06G.
W72-07206

THE USE OF QUI TAM ACTIONS TO PROTECT THE ENVIRONMENT,
Kafin and Needleman, Glen Falls, New York.
For primary bibliographic entry see Field 06G.
W72-07207

QUI TAM ACTIONS UNDER THE 1899 REFUSE ACT: POSSIBILITY OF INDIVIDUAL LEGAL ACTION TO PREVENT WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W72-07208

LITTORAL STATE HAS NO RIGHTS OVER THE BED OF THE CONTINENTAL SHELF OTHER THAN THOSE OF EXPLORATION AND EXPLOITATION,
P. M. Eisemann.
Journal of Maritime Law and Commerce, Vol. 3, p. 189-192, October 1971. 10 ref.

Descriptors: *International law, *Continental shelf, *International waters, *Judicial decisions, *Foreign countries, Exploration, Exploitation, Legal aspects, Water law, Littoral, Beds under water, Jurisdiction, Administrative agencies, Political aspects, Institutional constraints, Boundary disputes, Treaties, Foreign waters, Law of the sea.
Identifiers: *France, *Contiguous zone, *Territorial waters, *Geneva Convention on the Territorial Sea and the Contiguous Zone, Sovereignty.

A recent decision of the highest French administrative court, interpreting the International Convention on the Territorial Sea and Contiguous Zone, is noteworthy for its clarification of the relationship between territorial waters and the contiguous zone in international law. The French court explained that under the Convention a state exercises sovereignty over its territorial waters, but it exercises only limited police power, not sovereignty, over the contiguous zone beyond the territorial waters. Territorial waters extend a maximum of three miles from the baseline; the contiguous zone extends a maximum of 12 miles from the same baseline. International practice has, however, accepted a state extension of its territorial limits to 12 miles. This eliminates the contiguous zone. Moreover, by international convention a littoral state enjoys certain exclusive sovereign rights, not sovereignty, over the continental shelf. France has set its territoral limits at three miles. The recent case is also improtant because it correctly interprets the Convention on the Continental Shelf at a time when states are prone to interpret 'sovereign rights' too broadly. (Grant-Florida)
W72-07209

OIL POLLUTION BY SHIPS AND FREEDOM OF THE HIGH SEAS,
Tel-Aviv Univ. (Israel).
For primary bibliographic entry see Field 05G.
W72-07210

NATIONAL WEEKLIES, INC. V. JENSEN (CITY'S LIABILITY FOR NEGLIGENCE IN FLOODING OF BUILDING).

235 N.W. 905-909 (Minn. 1931).

Descriptors: *Minnesota, *Storm runoff, *Water injury, *Flood damage, Cities, Legal aspects, Judicial decisions, Water law, Damages, Remedies, Storms, Cloudbursts, Precipitation (Atmospheric), Rain, Runoff, Flash floods, Floods, Rain water, Overflow, Floodwater, Acts of God, Negligence.

Plaintiff landowner sued defendant city to recover damages for the negligent flooding of the basement of his building. While improving a street, the city had removed a portion of the stone curb and brick paving adjacent to plaintiff's retaining wall. A hard rain later flooded plaintiff's basement. Plaintiff alleged that the city was negligent in permitting the basement to remain unprotected. The city contended that since the rainfall was unduly severe and constituted an act of God, the city was not liable. The verdict was for the defendant in the first trial court; but, upon retrial on plaintiff's motion, the verdict was for the plaintiff. The Supreme Court of Minnesota affirmed. A city is liable for flood damages if its negligence, notwithstanding an unusually heavy rainfall, was a proximate cause. (Robinson-Florida)
W72-07211

CHICAGO, M. AND G. R.R. V. WHEELER (OVERFLOW CAUSED BY NEGLIGENT RECONSTRUCTION OF TRESTLE).
1 Tenn. App. 100-111 (1925).

Descriptors: *Tennessee, *Obstruction to flow, *Flood damage, Overflow, Ditches, Railroads, Crops, Land, Land tenure, Drainage, Water courses (Legal), Rainfall, Damages, Construction, Legal aspects, Judicial decisions, Banks, Floods, Water levels, Drainage effects.

Plaintiff farm lessee sued defendant railroad for damages resulting when his crops were flooded. Plaintiff alleged that defendant had reconstructed a trestle passing over a ditch so as to obstruct the ditch and impede drainage. Plaintiff further alleged that defendant negligently allowed this condition to persist. Defendant contended that other obstructions contributed to plaintiff's damage, that extraordinary rainfall was the proximate cause of the damage, and that there had been no negligence in reconstructing and maintaining the trestle. The Tennessee appellate court held that a railroad which negligently constructs a trestle across a ditch so that drifts accumulate against the piling, thereby causing water to overflow and injure crops, is liable for resulting damages, especially where such drifts are permitted to remain for an unreasonalbe time. The court also held that a farm lessee is not required to dig a ditch to protect himself from waters obstructed by a railroad trestle. The court affirmed a jury verdict for plaintiff. (Duss-Florida)
W72-07212

HURLEY V. KINCAID (COMPENSATION FOR TAKING OF PROPERTY FOR FLOOD CONTROL PURPOSES).
285 U.S. 95, 52 S. Ct. 267-269 (1932).

Descriptors: *Louisiana, *Mississippi River, *Flood control, *Condemnation value, Floodways, Federal government, Legal aspects, Judicial decisions, Remedies, Legislation, Eminent domain, Compensation, Administrative agencies, Levees, Water control, Flood protection, Flood routing, Mississippi River Basin, Navigable rivers.

Plaintiff farmer sued to enjoin defendant United States and certain of its officers and agencies from carrying out a flood control project involving a floodway which allegedly would result in greatly increased flooding of plaintiff's land. The floodway was to be constructed under the Mississippi River Floodway Control Act. The suit was dismissed against the United States, which had not consented to be sued, but continued against the Secretary of War and others. Defendants contended the project would not cause increased flooding of plaintiff's land. The district court ruled the project would result in a taking of plaintiff's property and issued an injunction. The United States Supreme Court held the taking of plaintiff's land could be compensated under a federal law, and that the fifth amendment did not require payment in advance. The Court denied an injunction because plaintiff had a proper remedy in an action at law, rather than through an injunction to force prior condemnation and compensation. (Morris-Florida)
W72-07213

LEININGER V. COUNTY HIGHWAY COMMITTEE (DAMAGES FOR THE OBSTRUCTION OF SURFACE RUNOFF).
258 N. W. 368-370 (Wis. 1935).

Descriptors: *Wisconsin, *Surface drainage, *Condemnation value, *Surface runoff, *Highway relocation, Legislation, Eminent domain, Damages, Land tenure, Highways, Outlets, Ditches, Construction, Surface waters, Legal aspects, Judicial decisions, culverts, Right-of-way, Adjacent land owners, Repulsion (Legal aspects), Diversion.

Plaintiff adjacent land owners, in condemnation proceedings, sought to assess damages for a taking of their property resulting from highway relocation. Obstruction of surface water was among the elements of damages alleged. The Supreme Court of Wisconsin held that damages from the obstruction or diversion of surface water may not recovered in highway relocation condemnation proceedings, because the obstruction or diversion is not incident to the taking of property. However, the court ruled that plaintiffs did have a cause of action based on a Wisconsin statute making governmental entities liable for failure to provide proper highway drainage. The lower court's denial of damages for the obstruction of surface water was affirmed on grounds that plaintiffs had not sought relief under the statute. (Duss-Florida)
W72-07214

SIGLER V. INTER-RIVER DRAINAGE DIST. (DRAINAGE DISTRICT'S LIABILITY FOR INUNDATION OF LAND).
279 S.W. 50-60 (Mo. 1925).

Descriptors: *Missouri, *Drainage districts, *Repulsion (Legal aspects), *Watercourses (Legal aspects), Rivers, Floods, Surface waters, Surface runoff, Administrative agencies, Eminent domain, Condemnation, Remedies, Drainage water, Riddance (Legal aspects), Legal aspects, Judicial decisions, Levees, Flood control.

Plaintiff landowners sued for damages to their crops caused by defendant drainage district's levee which obstructed the natural sloughs and drains and prevented the return of vagrant floodwater to a river. Defendant contended that since plaintiffs' land was wholly outside the district any injury caused by the levee resulted solely from repulsion of surface water, which defendant had a right to protect himself against. The Missouri supreme court held that a drainage district is a governmental agency exercising police power, and that such a district has the right to obstruct vagrant surface water in order to protect lands within the district. Injury caused to an owner of land outside the district constitutes damnum absque injuria. The court ruled that the obstructed slough was not a watercourse, because the evidence showed that in several places it was eight miles wide and had no banks to contain a channel. Moreover, the only appreciable flow of water was floodwater from a nearby river. A watercourse must have a flow of water attributable to a source other than the overflow of another water body. (Grant-Florida)
W72-07215

THE NATIONAL PARKS, MILITARY PARKS, MONUMENTS, AND SEASHORES (CREATION OF NEW PARKS, MONUMENTS, AND AREAS).
16 USCA secs 79A thru 79J, 90 thru 90E-3, 450qq thru 450qq-4 (Supp. 1969).

Descriptors: *National parks, *National recreation areas, *National monuments, *National memorials, Federal government, Governments, Administration, Legislation, Regulation, Standards, National forests, Public lands, Parks, Recreation, Conservation, Forests, Rivers, Lakes, Mountains, Federal reservations, Florida, Washington, California.

The following new national parks, recreation areas, monuments, and wilderness areas are created: (1) Redwood National Park, (2) North Cascades National Park, (3) Ross Lake National Recreation Area, (4) Lake Chelan National Recreation Area, (5) Pasayten Wilderness, and (6) Biscayne National Monument. Procedures for acquisition of lands by purchase or donation are described as are methods of administering these areas. Boundaries are described. Certain procedures for state and federal cooperation are outlined. The Secretary of the Interior is authorized to acquire interests in land from, and to enter into contracts and cooperative agreements with, owners of land both on the periphery of Redwood National Park and on watersheds that feed the streams within the Park. This authority is conferred to protect the streams, timber, and soil within the Park. Interests in land shall not include fee title unless the cost of less than fee interests is disproportionately high. (Robinson-Florida)
W72-07216

A PRIMER ON ENVIRONMENTAL LITIGATION,
Speiser, Shumate, Geoghan, Krause, and Rheingold, New York.
For primary bibliographic entry see Field 06G.
W72-07217

FLOOD WARNINGS--THE ROLE OF THE NEW SOUTH WALES CIVIL DEFENCE ORGANISATION,
Civil Defence Organization, Sydney (Australia).
For primary bibliographic entry see Field 02A.
W72-07242

6F. Nonstructural Alternatives

STURDY HOMES, INC. V. TOWNSHIP OF REDFORD (CONSTITUTIONALITY OF FLOOD PLAIN CONTROL ORDINANCE).
For primary bibliographic entry see Field 06E.
W72-06899

POLICY TOWARD FLOOD PLAIN MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 06B.
W72-06965

6G. Ecologic Impact of Water Development

ECONOMIC AND ENVIRONMENTAL EVALUATION OF DEVELOPMENT ALTERNATIVES FOR BEAUFORT COUNTY, SOUTH CAROLINA,
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 06B.
W72-06605

MUD GULCH FLOOD PREVENTION PROJECT MEASURE, SANGRE DE CRISTO RC AND D

PROJECT, COLORADO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-06642

WAIKIKI BEACH (KUHIO BEACH SECTOR), OAHU, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
For primary bibliographic entry see Field 08A.
W72-06643

KANEOHE-KAILUA AREA, OAHU, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
For primary bibliographic entry see Field 08A.
W72-06644

FLOOD CONTROL IMPROVEMENT ON ESOPUS CREEK AT KINGSTON, NEW YORK; HUDSON RIVER, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 08A.
W72-06645

COLORADO RIVER BASIN PILOT PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Denver, Colorado. Engineering and Research Center.
For primary bibliographic entry see Field 03B.
W72-06646

STONEWALL JACKSON LAKE, WEST FORK RIVER, WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 08A.
W72-06647

PECOS RIVER BASIN WATER SALVAGE PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Amarillo, Tex.
For primary bibliographic entry see Field 03B.
W72-06648

RIDGECREST WASH CHANNEL, KERN COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 04A.
W72-06649

LOWER KLAMATH RIVER FLOOD CONTROL PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 08A.
W72-06650

BERWIND SNAGGING AND CLEARING PROJECT, DRY FORK OF TUG FORK OF BIG SANDY RIVER, WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 04A.
W72-06651

CORPS OF ENGINEERS CAUGHT UP IN BATTLE OF THE BUILDERS AGAINST THE PRESERVERS,
For primary bibliographic entry see Field 06E.
W72-06653

ENVIRONMENTAL DEFENSE FUND, INC. V. CORPS OF ENGINEERS.
For primary bibliographic entry see Field 06E.
W72-06665

ENVIRONMENTAL PROTECTION: WATER.
National Academy of Engineering, Washington, D.C. Committee on Power Plant Siting.

Available from Printing and Publishing Office, Nat. Academy of Sciences, Wash. D.C. 20418, $10.50. In: Engineering for Resolution of the Energy-Environment Dilemma; National Academy of Engineering, Washington, D.C., 1972, p 81-150, 22 fig, 11 tab, 101 ref. NSF Contract NSF-C310, T.O. 204.

Descriptors: *Powerplants, *Thermal pollution, *Surface waters, *Ecology, *Sites, Water pollution control, Reviews, Planning, Environmental effects, Aquatic environments, Electric powerplants, Erection, Estuaries, Lakes, Rivers, Reservoirs, Heated water, Cooling water.
Identifiers: Powerplant siting.

The Water Working Group of the National Academy of the Engineering Committee on Power Plant Siting is concerned with alternatives available to blend electricity production in the most compatible way with the aquatic environment. Six different ecosystems are recognized in electric generation: (1) oceanic, (2) estuarine, (3) riverine, (4) lake, (5) reservoir, and (6) cooling pond. All have certain diverse physical, chemical, and biological features which may require slightly different siting and design considerations from a national, regional, and local siting basis. Publications that have dealt with various phases of the electric generation-environment interaction are reviewed, and a list of key publications is included. The objectives of the Water Working Group are to: (1) Establish a procedural pattern for siting considerations, (2) Give high visibility to areas of possible incompatibility or of problem interactions, (3) Suggest solutions or alternatives to minimize conflicts, and (4) Provide some suggestions for research priorities in order to assist in providing useful information needed in problem solving. (Woodard-USGS)
W72-06693

ENVIRONMENTAL CONCEPTS FOR MT. ELBERT POWERPLANT,
Bureau of Reclamation, Denver, Colo.
G. Evans.
Paper, International Conference on Pumped Storage Development and Environmental Effects, Milwaukee, Wisconsin, Sept 1971. 38 p, 14 fig, 2 ref.

Descriptors: *Environment, *Aesthetics, *Ecology, *Pumped storage, Aquatic life, Water quality, Recreation facilities, Fish, Water pollution control, Air pollution, Control, Reservoirs, Revegetation, Landscaping, Hydroelectric power, Noise reduction, Design criteria.
Identifiers: *Fryingpan-Arkansas Project (Colo), Mount Elbert Pump-Storage Plant (Colo), Landscapes.

The 200-mw Mt. Elbert Pumped Storage Powerplant is a key feature in the Bureau of Reclamation Fryingpan-Arkansas Project. The project diverts water from west to east under the Continental Divide. Mt. Elbert Powerplant will be situated in National Forest lands just east of 14,431-ft Mt. Elbert, the highest point in Colorado. Protection and enhancement of the environment are essential, particularly since the powerplant and appurtenances are located in an established recreational area. The design of the powerplant included plans for minimizing the impact of people on the natural environment and provisions for improved aesthetic, recreational, and educational experiences. Special cleanup provisions are required for construction sites and camps in order to leave the area in a natural-appearing condition. (USBR)
W72-06756

ECOLOGY AND LAND USE OF THE SUPPLY PONDS NATURAL AREA, BRANFORD, CONNECTICUT,
Diana S. Cooper, and William L. Hotaling.
Yale University SCHOOL OF Forestry, New Haven, Conn., 1970. 56 p.
Identifiers: Animals, Book, Branford, Connecticut, Conservation, Ecology, Land, Natural, Plants, Ponds, Samples.

The ecology and land use of the Supply Ponds Natural Area of Branford, Connecticut were studied by 2 graduate students of the School of Forestry at Yale University. The study brings theory and practice together in man's understanding and use of his environment, presenting information theories and methods which the town can apply in making practical decisions in performing its task of land stewardship. Section I is a short explanation of some basic ecological principles which underlie subsequent information about the tract and analysis of its use potentials. Section II gives a brief look at the area's history. Sections III, IV and V present an inventory of the area's resources. Section III describes physiographic and climatological features within the Supply Ponds Natural Area and those outside it which affect the area. Section IV inventories living plants and animals within the area, and the ways in which they react with each other and their physical environment to form ecosystems. Section V describes the scenic landscape as it is formed by features and species given in Sections III and IV. Section VI discusses the populus, with a description of the Town of Branford, its needs for conservation, education and recreation, ways in which Branford people would like to use the Supply Ponds Natural Area, and information about the administration of the area. Section VII is a summary section, in which information from all the preceding sections is brought together to suggest management and use alternatives for the area. Appended are the preliminary species lists of vegetation and animals, the bedrock geology, and the results of Connecticut State Health Department's water samples.--Copyright 1971, Biological Abstracts, Inc.
W72-06824

THE ROLE OF THE ENVIRONMENTAL PROTECTION AGENCY,
Environmental Protection Agency, Washington, D.C.
W. D. Ruckelshaus.
Environmental Affairs, Vol. 1, No. 3, p. 528-533, November, 1971.

Descriptors: *Federal government, *Administrative agencies, *Water pollution control, *Pollution abatement, United States, Standards, Social aspects, Legislation, Legal aspects, Water law, Administration, Federal project policy, Permits, Coordination, Education, Planning, Regulation, Non-structural alternatives, Environmental effects, Social adjustment, Rivers and Harbors Act, Clean Air Act.

The primary mission of the Environmental Protection Agency (EPA) is simultaneously to consolidate, evaluate, and improve present knowledge of our physical environment, while applying environmental restoration techniques that already exist. The Agency brings under one roof federal programs dealing with air and water pollution, drinking water quality, solid wastes, pesticides, and environmental radiation. The Agency's duties include the following: (1) establishing and enforcing standards, (2) monitoring pollution, (3) conducting research and demonstrations, and (4) assisting state and local governments in pollution control. In defending the environment, EPA utilizes the National Environmental Policy Act, which makes all federal actions which might have significant environmental implications subject to EPA review, and an executive order requiring permits for the disposal of industrial wastes in navigable waters. Proposed legislation would expand the Agency's authority in relation to pesticides, toxic substances, and ocean waste dumping. While

much remains to be done before effective environmental controls can be established, society must develop an environmental ethic. Each individual must realize his own environmental impact. (Johnson-Florida)
W72-06871

ENVIRONMENTAL LITIGATION: STRENGTHS AND WEAKNESSES,
American Native Rights Fund, Boulder, Colo.
J. F. Brecher.
Environmental Affairs, Vol. 1, No. 3, p. 565-577, November 1971. 30 ref.

Descriptors: *Environmental sanitation, *Adjudication procedure, *Judicial decisions, *Non-structural alternatives, *Pollution abatement, Economics, Rivers and Harbors Act, Legal aspects, Public rights, Water law, Administrative agencies, Federal government, Legislation, Permits, Project planning, Regulation, Environmental effects, State governments, Adoption of practices, Costs, Water quality control, Water pollution control.
Identifiers: National Environmental Policy Act, Class actions, Refuse Act.

Environmental litigation is most often used in emergency situations to temporarily halt environmentally dangerous activities. Such litigation may be useful in: (1) arousing public concern and thereby creating political pressure; (2) allowing cross-examination of polluters to get direct answers; (3) making data in the hands of the resource user available through discovery; (4) hastening governmental pollution control efforts; and (5) reducing the inherent superiority of polluters in terms of money, power, and influence. There are several drawbacks to environmental litigation: (1) the heavy expense required to maintain such litigation; (2) the tremendous economic burden which environmental clean-up would cast upon the polluter; (3) judicial inability to go beyond the immediate parties in fashioning appropriate relief; and (4) the transitory nature of court victories, which may eventually become administrative defeats. Many environmental lawsuits are brought under the National Environmental Policy Act of 1969 and the Refuse Act. Many are brought as class actions. While several standing problems have been overcome, administrative delay may sometimes be used to thwart environmental litigation. (Johnson-Florida)
W72-06872

LONGVIEW LAKE, LITTLE BLUE RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer, District, Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W72-06881

DANBURY LOCAL PROTECTION PROJECT, STILL RIVER, DANBURY, CONNECTICUT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 08A.
W72-06882

ENVIRONMENTAL DEFENSE FUND, INC. V. CORPS OF ENGINEERS (STANDING OF ENVIRONMENTAL ORGANIZATION TO CONTEST DAM CONSTRUCTION).
For primary bibliographic entry see Field 06E.
W72-06897

OUR MARINE HERITAGE,
National Council on Marine Resources and Engineering Development, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-06905

PRELIMINARY ANALYSIS OF THE ECOLOGICAL ASPECTS OF DEEP PORT CREATION AND SUPERSHIP OPERATION.
Institute for Water Resources (Army), Alexandria, Va.
For primary bibliographic entry see Field 08A.
W72-06923

ENVIRONMENTAL PLANNING AND MANAGEMENT,
Drexel Univ., Philadelphia, Pa.
For primary bibliographic entry see Field 06B.
W72-06938

ENVIRONMENT AND HEALTH,
Drexel Univ., Philadelphia, Pa.
For primary bibliographic entry see Field 05G.
W72-06940

OUTLINE OF ENVIRONMENTAL SCIENCES,
Illinois, Univ., Urbana. Dept. of Entomology; and Illinois Univ., Urbana. Dept. of Zoology.
R. L. Metcalf.
In: Advances in Environmental Sciences, John Wiley and Sons, Inc., 1969. p 1-23. 3 fig, 7 tab, 18 ref.

Descriptors: *Environment, *Quality control, *Population, *Agriculture, *Industries, Air pollution, Water pollution, Waste disposal, Ecology, Conservation, Management, Resources.
Identifiers: *Environmental sciences, Environmental quality control, Soil pollution, International world conference on pollution.

Environmental Science is defined as basic and applied inquiry about changes in environmental quality resulting from the activities of man. There are three environments: (1) the internal environment of the body, (2) the immediate environment of air breathed, water drunk, and food eaten, and (3) the general environment of the earth as a whole. Some of the significant problems arising from the unprecedented rate of increase of the human species and the impact of the agricultural and industrial revolutions are discussed. These problems include environmental quality control, air pollution, water pollution, soil pollution, and waste disposal. The international nature of many of these problems has been recognized. For example, Sweden has asked the United Nations to convene a world conference on pollution in 1972. (Strachan-Chicago)
W72-06941

THE ENVIRONMENT: PAST, PRESENT, AND PLUPERFECT,
Johns Hopkins Univ., Baltimore, Md. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 06B.
W72-06951

ENVIRONMENTAL PLANNING: 1 - ENVIRONMENTAL INFORMATION FOR POLICY FORMULATION,
M. J. Meshenberg.
Planning Advisory Service Report No. 263, American Society of Planning Officials, November 1970. 52 p, 2 fig, 76 ref, 8 photo, 4 map, 1 tab, 1 append.

Descriptors: *Environment, *Planning, *Long-term planning, Quality control, Data collection, Analysis, Conservation, Maintenance, Land development, *Comprehensive planning, *Water resources development.
Identifiers: *Policy making, *Long-range consequences, Information.

Why the quality of the environment should be given greater attention in the planning process than it has received in the past is discussed. The data which should be collected and analyzed for inclusion in the comprehensive plan are described. Conservation and development are not mutually exclusive; when conservation is considered a part of the development process, the likelihood of long-run success is improved. An inventory and analysis of environmental resources are made. Two points are emphasized. (1) While many agencies have conducted studies, few have used them as significant inputs into the planning process. Environmental studies should have a bigger role, and not be used merely to identify developmental hazards. They should help the planning agency to prepare plans which reflect the maintenance of environmental quality as a basic principle. (2) Time is an important consideration. Land development process occurs without knowledge, appreciation, or understanding of the effect that development will have on future environmental quality. The individuals who control development and environmental quality improvement must be conscious of long-range consequences. Cooperation is demanded from a wide variety of professional and scientific disciplines which have had little contact with each other until now. The current awakening of concern for environmental quality is an important first step, but in itself, is not sufficient. Concern must be translated into positive action. (Strachan-Chicago)
W72-06955

CONFLICTS IN WATER RESOURCES PLANNING.
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 06B.
W72-06958

COMPROMISES BETWEEN WILDERNESS PRESERVATIONS AND WATER RESOURCE DEVELOPMENT,
Texas Univ., Austin.
For primary bibliographic entry see Field 06B.
W72-06968

IN BALANCE WITH NATURE--A BIOLOGICAL MYTH,
Centro Internacional de Mejoramiento de Maiz y Trigo, Mexico City.
N. E. Borlaug.
BioScience, Vol. 22, No. 1, p 41-44, January 1972.

Descriptors: *Conservation, *DDT, *Agriculture, *Public health, *Ecosystems, Natural resources, Animals, Plants, Pesticides, Environmental effects.
Identifiers: Mercury pollution.

A recent nobel prize winner, the author, attacks the book 'Silent Spring', for its 'Distorted, oversimplified biological half-truths'. Various individuals and conservation organizations are similarly indicted. In condemning DDT, rarely mentioned are the importance of other chemicals such as fertilizers for producing food and fiber crops or the great role that DDT has played in curtailing the incidence of malaria in so many parts of the world. It is agreed that we should try to preserve all forms of wildlife as part of our heritage, as far as possible to do so. However, too many people seem to forget that 99% of all the animal species that ever lived are now extinct, and that extinction is part of the natural order of things in nature, with only well-adapted animals surviving. Of the 1,450,000 species of plants and animals in the world (approximately), only 81 vertebrate species were listed by the U.S. Fish and Wildlife Service as being in danger of extinction in 1966, and most were affected by habitat destruction, not pesticides. The phrase 'in balance with nature' is a meaningless cliche. Ecosystems are in a state of dynamic change and the attempts of conservationists to picture them as static and unchanging lead to programs and protests against current agricultural practices that are unrealistic. The problem of mercury in waters is also discussed and dismissed because the data do not support the alarmists. (Casey-Arizona)
W72-07032

RELATIONSHIPS BETWEEN MICRO CLIMATIC PARAMETERS, AND BASUTO DWELLING SITES IN THE MARAKABEI BASIN, LESOTHO,
McGill Univ., Montreal (Quebec). Dept. of Geography.
R. F. Fuggle.
South African Journal of Science, Vol 67, No 9, p 443-450, September 1971. 7 fig, 1 tab, 7 ref.

Descriptors: *Microenvironment, *Microclimatology, *Temperature, *Locating, *Slope protection, Altitude, Diurnal, Behavior, Beneficial use, Solar radiation, Land use, Human populations, Environmental effects, On-site investigations, Physiography, Arid lands.
Identifiers: *Lesotho, *Human ecology, *Location analysis, *Azimuthal distribution.

Man's choice of dwelling type and settlement location has long been a major concern of cultural geography, particularly with respect to the factors which play a role in these choices. Both cultural and environmental factors are known to be important, although their relative importance is not well understood. For more than a century, observers have speculated on the relationships between high altitude Basuto hut sites and microclimatic zones. An intensive study was conducted in the Lesotho Mountains in order to elucidate the critical factors. The Marakabei basin was chosen as the study site because of its overall symmetry in the basin's physiography and because a settlement is known to have existed here long before the onset of any European influence. The altitude as well as the angle and azimuth of the slope were determined for each hut site. There was an overwhelming concentration of dwellings in the NE Quadrant, with absolutely no hut sites on south-facing slopes. Hut site altitudinal distribution was chosen to avoid the cold nocturnal valley inversion as well as the upper slope low mean temperatures. The cold nocturnal valley inversion as well as the upper slope low mean temperatures. The midslope azimuthal locations were shown to experience higher daily maximum temperatures and maximum solar heating on winter mornings. For these reasons it was concluded that microclimatic considerations were most important though not necessarily all-inclusive in dwelling site decisions. (Casey-Arizona)
W72-07050

DUCK CREEK CHANNEL IMPROVEMENT--GARLAND, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 04A.
W72-07177

KLUTINA RIVER FLOOD CONTROL, COPPER CENTER, ALASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 08D.
W72-07178

MANAGEMENT OF FRENCH PETE CREEK, WILLAMETTE NATIONAL FOREST, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Forest Service (USDA), Washington, D. C.
For primary bibliographic entry see Field 04D.
W72-07179

MARTINS FORK LAKE, CUMBERLAND RIVER BASIN, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Nashville, Tenn.
For primary bibliographic entry see Field 08A.
W72-07180

CALVERT CLIFFS' COORDINATING COMM, INC. V. ATOMIC ENERGY COMM. (FULL CONSIDERATION OF ENVIRONMENTAL EFFECTS IN ADMINISTRATIVE DECISION MAKING).
For primary bibliographic entry see Field 06E.
W72-07191

ENFORCEMENT OF ENVIRONMENTAL LAW ON THE LOCAL LEVEL,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 05G.
W72-07195

POWER AND THE ENVIRONMENT: A STATUTORY APPROACH TO ELECTRIC FACILITY SITING,
H. E. Lippek.
Washington Law Review, Vol. 47, p. 35-72, October 1971. 101 ref.

Descriptors: *Environmental engineering, *Environmental effects, *Electric power production, *Electric power industry, *Sites, Electric powerplants, Hydroelectric plants, Nuclear powerplants, Air pollution, Water pollution, Pollution abatement, Thermal pollution, Technology, Social aspects, Adoption of practices, Attitudes, Decision making, Federal government, Social change, Social change, Social values, Political aspects, Project planning, Legislation, Electric power demand, Economic impact.

The sharpened conflict between environmental protection and the increased need for electric power can only be resolved by adjusting conflicting interests and altering present attitudes. Current regulatory structure is outlined, and its faults are examined. Major concern for the environment is lacking is planning most power plant siting, but some signs of change have appeared. Federal regulation of siting is also discussed. Effective environmental protection will come about only after a change in the present value scheme of the power industry. This will require a reduction in power demand through curtailment of government subsidies and alteration of rate structures; creation of incentives for pollution control technology; adoption of national, environmentally oriented siting controls; and integration of local, state, and federal planning. A proposed model state power facility siting statute is included. Its provisions are discussed and compared to current procedure. (Grant-Florida)
W72-07206

THE USE OF QUI TAM ACTIONS TO PROTECT THE ENVIRONMENT,
Kafin and Needleman, Glen Falls, New York.
R. J. Kafin, and N. E. Needleman.
New York Law Forum, Vol. 17, p. 130-140, 1971. 48 ref.

Descriptors: *Rivers and Harbors Act, *Remedies, *Judicial decisions, *Public rights, *Adjudication procedure, Water law, Legal aspects, Legislation, Regulation, Administrative agencies, Federal government, Environmental sanitation.
Identifiers: *Qui tam actions, *Standing, *Refuse Act.

Qui tam actions are brought by private citizens to collect a portion of a monetary penalty for statutorily designated unlawful acts. Such actions are a well-established part of the American legal system. Attempts to enforce the Rivers and Harbors Act of 1899 through use of qui tam actions have, however, been rejected. Two principal reasonings have been applied by the courts: (1) the Act's vesting of enforcement in the Department of Justice precludes a private right of action, and (2) the only right of the private informant is in a criminal fine imposed by the Act. Any conflict between private actions and governmental enforcement is denied: private actions are derivative of the right of the government to bring the same action. The civil-criminal distinction is also rejected. Moreover, qui tam actions have historically been used in many contexts that would be considered criminal. The proposed New City Air Pollution Control Code is also discussed. (Doise-Florida)
W72-07207

A PRIMER ON ENVIRONMENTAL LITIGATION,
Speiser, Shumate, Geoghan, Krause, and Rheingold, New York.
P. D. Rheingold.
Brooklyn Law Review, Vol. 38, p. 113-128, Summer 1971. 16 p, 86 ref.

Descriptors: *Adjudication procedure, *Judicial decisions, *Environmental effects, *Water resources development, *Pollution abatement, Water law, Legislation, Legal aspects, Social aspects, Water pollution, Public health, Administrative agencies, Federal government, State governments, Environmental sanitation, Nonstructural alternatives, Water rights.

The growth of environmental law, a new and rapidly expanding area of jurisprudence, is examined. The effects of environmental public interest cases on traditional rules of standing and judicial review are analyzed. Courts now accord less presumptive validity to environmental decisions of government. The Environmental Policy Act of 1969 has been used to create substantive environmental law, to broaden judicial review, to create jurisdiction, and to establish standing. Jurisdiction problems are discussed, as in the problem of multiple parties. Substantively, modern antitrust law, securities law, civil rights law, and products liability law have added to the common law basis of environmental law. Statutes have also proven to be helpful sources of substantive law. Several constitutional theories have recently been advanced against polluters, including a constitutional right to clean air, water, and a healthful environment. The 'trust theory' of holding lands has also been used. The doctrine of balancing the equities has been invoked by some courts. Recent triumphs in the protection of water resources will be illusory if comprehensive legislation is not enacted to deal with all environmental abuses. (Grant-Florida)
W72-07217

A PRELIMINARY ECOLOGICAL STUDY OF AREAS TO BE IMPOUNDED IN THE SALT RIVER BASIN OF KENTUCKY,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 04A.
W72-07224

07. RESOURCES DATA

7A. Network Design

ELECTRICAL AND SEISMIC PROPERTIES OF THE EARTH'S CRUST IN THE SOUTHWESTERN GREAT PLAINS OF THE U.S.A.,
Texas Univ., Dallas.
For primary bibliographic entry see Field 02F.
W72-06730

OPERATIONAL HYDROMET DATA MANAGEMENT SYSTEM--DESIGN CHARACTERISTICS.
North American Rockwell Information Systems Co., Anaheim, Calif.

Available from NTIS, Springfield, Va. 22151 as PB-204 255 Price $6.00 (printed copy). Summary Report, October 15, 1971. 315 p, 32 fig, 27 tab.

Descriptors: *Hydrologic data, *Data collections, *Network design, *Data transmission, *Telemetry, Federal Government, Data processing, Data storage and retrieval, Computers, Digital computers, Automation.

Identifiers: *Real-time data, Hydromet stations.

Seven participating Federal agencies through the Columbia River Water Management Group are developing an interagency cooperative hydromet network for the collection, storage and distribution of operational hydromet data. The seven Federal agencies are: U.S. Corps of Engineers, Bonneville Power Administration, U.S. Bureau of Reclamation, U.S. Geological Survey, U.S. Forest Service, National Weather Service, and Environmental Protection Agency. The hydromet system under development will include a central data bank operated by the U.S. Corp of Engineers, a large number of automated hydromet data gathering stations interfacing with the central data bank, and data retrieval facilities for interfacing the participating agencies with the data bank. The Operational Hydromet Data Management System (OHDMS) will be based in a large scale digital computer with appropriate large volume digital storage devices and peripherals. It will include a real-time digital data acquisition subsystem operating in association with an extensive manual data gathering network and a diverse user terminal subsystem for retrieval of stored hydromet data. The format for this operation is presented. (Woodard-USGS)
W72-06793

7B. Data Acquisition

HYDRAULIC CONDUCTIVITY MEASUREMENTS WITH A PRESSURE TRANSDUCER,
Illinois Univ., Urbana. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W72-06677

A SHORT NOTE ON THE SPEED CALIBRATION OF THE GEODYNE MODEL 920 CURRENT METER,
Henry S. Weiler.
Canada Department of the Environment, Inland Waters Branch Technical Bulletin no 57, 1971. Ottawa. 7 p, 3 fig, 1 tab, 3 ref.

Descriptors: *Current meters, *Calibrations, Instrumentation, Measurement, Velocity.
Identifiers: Geodyne current meter.

The Geodyne Division of EG and G International manufactures the Model 920 Tape Recording Current Meter. With the meter, it supplies a standard speed-calibration table. Comparison of this table with direct calibrations shows that the standard table produces large errors in the measurements, especially at low speed. Analysis of these errors leads to the conclusion that the standard table should not be used; rather, a table formed from fitting least-square curves to direct calibration data would give much greater accuracy in speed measurements. (CCIW)
W72-06684

STUDY OF SENSORS FOR EARTH RESOURCE SATELLITES AND REMOTE AIRBORNE SENSING,
McMaster Univ., Hamilton (Ontario). Centre for Applied Research and Engineering Design.
Joseph Mac Dowall, and B. H. Nodwell.
Project 156, 1971. 178 p.

Descriptors: *Remote sensing, *Satellites (Artificial), *Instrumentation, *Cameras, *Spectrometers, Aerial photography, Infrared radiation, Ultraviolet radiation, Microwaves.

A survey was made of earth resource survey sensors which were either available or under development in 1971. This report is a compendium of significant physical characteristics of remote sensors arranged so that comparison of characteristics between sensors can be made. Active and passive sensors in the UV, visible, IR and microwave spectra are considered. (Fosdick-CCIW)
W72-06686

IMAGE ENHANCEMENT TECHNIQUES FOR IMPROVING SEA-ICE DEPICTION IN SATELLITE INFRARED DATA,
Allied Research Associates, Inc., Concord, Mass.
J. C. Barnes, D. T. Chang, and J. H. Willand.
Journal of Geophysical Research, Vol 77, No 3, p 453-462, January 20, 1972. 8 fig, 1 tab, 8 ref. NOAA Contract E-67-70 (N).

Descriptors: *Remote sensing, *Aerial photography, *Photometry, *Sea ice, Infrared radiation, Photogrammetry, Satellites (Artificial), Distribution patterns.

The application of image enhancement to improve sea-ice dipiction in satellite infrared data was investigated using Nimbus high resolution infrared radiometer (HRIR) measurements of the northern Canada-Greenland arctic region. Although ice boundaries can be detected in HRIR film strips by identifying relative temperature differences, quantitative interpretation of the film strips cannot be obtained even when the accompanying gray-scale wedges are used as reference. Based on densitometric analyses, experiments were performed to enhance the gray-scale contrast within the temperature range of interest. In an improved scheme, data are presented in a format from which accurate quantitative information can be visually derived and in which features of significance to sea-ice mapping are more clearly defined. (Knapp-USGS)
W72-06698

EVALUATION OF A TECHNIQUE FOR SORTING AND COUNTING STREAM INVERTEBRATES,
Memorial Univ. of Newfoundland, St. John's. Dept. of Biology.
Stanley Frost.
Can J Zool. 49 (6): 879-883. 1971. Illus.
Identifiers: Counting, Invertebrates, Sorting, Stream, Technique, Washing.

Washing was adequate for separating invertebrates and organic material from other debris in stony stream bed samples. Stream fauna among detritus was counted and the effects of different conditions assessed.--Copyright 1971, Biological Abstracts, Inc.
W72-06711

CONSOLIDATION AT CONSTANT RATE OF STRAIN,
Massachusetts Inst. of Tech., Cambridge.
A. E. Z. Wissa.
Journal of the Soil Mechanics and Foundations Division, American Society of Civil Engineers, Vol 97, No SM10, p. 1393-1413, Oct 1971. 10 fig, 1 tab, 13 ref, 3 append.

Descriptors: *Soil consolidation tests, *Soil tests, *Consolidation, *Soil mechanics, *Equipment, Laboratory tests, Back pressure, Pore pressure, Soil properties.
Identifiers: *Soil consolidation tests, Soil compression tests, Strain rate, Swelling pressure tests, Oedometer tests, Secondary consolidation, *Consolidometers.

The constant rate of strain (CRSC) test is a simpler and faster method of determining consolidation characteristics of soils. A new general purpose consolidometer was developed for studying the one-dimensional behavior of soils. The test specimen can be loaded incrementally, as in the conventional test, at a constant rate of stress, or at a constant rate of strain. The apparatus can also be used to measure residual pore pressures and swell pressures during back pressure saturation at constant volume. Pore pressures are measured at the impervious base, and free drainage occurs from the top surface. A general solution to the consolidation equation is derived for conditions of constant rate of strain assuming constant coefficient of consolidation. While particular solutions are given for both a linear soil having constant coefficient of volume compressibility and a nonlinear soil with constant compression index, for most purposes, the linear solution is sufficiently accurate for interpreting CRSC test results. The test can be fully automated; data are recorded on magnetic tape, then reduced and plotted by computer. (USBR)
W72-06743

ULTRASONIC METHOD OF FLOW MEASUREMENT IN LARGE CONDUITS AND OPEN CHANNELS,
Central Research Inst. of Electric Power Industry, Tokyo (Japan); and Tokyo Keiki Co. ltd. (Japan).
N. Suzuki, H. Nakabori, and M. Yamamoto.
Paper 12, International Conference on Modern Developments in Flow Measurement, Atomic Energy Research Establishment, Harwell, Great Britain, Sept 1971. 24 p, 15 fig, 4 photo, 6 tab, 5 ref.

Descriptors: *Water measurement, *Flowmeters, *Flow measurement, Open channels, Conduits, Flow rates, Application methods, Flow, Tests, Test results, Pipeline, Transducers, Installation, Water meters, Fluid mechanics.
Identifiers: *Ultrasonic flow measurement, *Acoustic velocity meters, *Sing around system, Japan, *Acoustic equipment.

More than 400 ultrasonic flowmeters have been installed on large diameter conduits and open canals in Japan. The modified sing-around system consists of 2 ultrasonic transducers mounted on the outside of the conduit wall or submerged in the open channel. Bursts of ultrasonic energy from the transmitter propagate through the liquid to the receiver, where the reception of a pulse triggers the transmission of the next burst, generating a continuous sing-around frequency. Some advantages of the system are: (1) no pressure loss, (2) installation on existing pipes without stopping the water, (3) installation cost is low compared with conventional meters. The operation principle and the practical applications of the meter for use on conduits and open channels are described. Results of comparisons between the ultrasonic flowmeter and conventional methods of water measurement are given. (USBR)
W72-06748

ULTRASONICS AS A STANDARD FOR VOLUMETRIC FLOW MEASUREMENT,
Westinghouse Electric Corp., Annapolis, Md.
S. G. Fisher, and P. G. Spink.
Paper 13, International Conference on Modern Developments in Flow Measurement, Atomic Energy Research Establishment, Harwell, Great Britain, Sept 1971. 27 p, 8 fig, 2 tab, 6 ref.

Descriptors: *Flow measurement, *Ultrasonics, Flowmeters, Sonar, Water measurement, Analysis, Accuracy, Volumetric analysis, Model studies, Fluid mechanics, Hydraulics.
Identifiers: *Ultrasonic flow measurement, *Acoustic velocity meters, *Acoustic equipment, Test results, Time intervals, Crossflow.

Leading edge ultrasonic flow measurement systems have demonstrated that volumetric flow, even with severely distorted velocity distributions, can be measured to 1% accuracy without prior calibration. The equipment technique is based on time measurements of sonar pluses propagated in opposite directions across the fluid medium. Measurements taken in several acoustic paths are combined according to a numerical integration technique to compute volumetric flow. Accuracies to 0.1% of flow can be achieved when the residual error of the integration has been established and corrected. Performance analysis is supported by application data. Computations of theoretical accuracies are based on mathematical expressions. The mathematical expression for volumetric flow rate is presented and then compared with the volumetric flow rate as calculated by a leading edge ultrasonic flow measurement system. An analysis of applicable sources of error is given. Laboratory

and field comparison evaluations supporting accuracy predictions are summarized. (USBR)
W72-06753

MODERN DEVELOPMENT AND NEW APPLICATIONS OF MAGNETIC FLOWMETERS,
Krohne (Ludwig) KG, Duisburg (West Germany).
R. Theenhaus.
Paper 29, International Conference on Modern Developments on Flow Measurement, Atomic Energy Research Establishment, Harwell, Great Britain, Sept 1971. 26 p, 6 illus, 2 photo, 8 ref.

Descriptors: *Magnetic studies, *Flow measurement, *Flow profiles, *Disturbances, Flowmeters, Potential energy, Electrodes, Electronic equipment, Amplifiers, Fluid mechanics, Calibrations, Instrumentation, Hydraulics.
Identifiers: *Magnetic flow meters, *Magnetic fields, Velocity profiles, Germany, Magnetic induction, Axial flow.

A survey of inductive flow measurement techniques and new theoretical investigations is given. The induced voltage of an inductive flowmeter is derived for an inhomogeneous magnetic field and an arbitrary velocity profile. Generally, the induced voltage is not proportional to the flow. Several ways of compensating for the influence of change in the velocity profile are discussed. Methods and limitations of measuring liquids of low conductivity are shown. Measuring accuracy is limited mainly by electrode deposits. Modern electronic concepts result in insensitivity on quadrature tensions, harmonics, and changes in the magnetic field caused by iron particles within the liquid. All inductive flow measurement devices from 2 mm up to the largest of 2 m should be calibrated experimentally because a tolerance smaller than plus or minus 0.5% cannot be achieved by theoretical calibration of the primary heads by measuring the magnetic field. (USBR)
W72-06754

RAINDROP CHARGE-SIZE MEASUREMENTS IN WARM RAIN,
Hawaii Univ., Hilo. Dept of Meteorology.
For primary bibliographic entry see Field 02B.
W72-06759

INSTRUMENTATION AND MEASURING TECHNIQUES,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 02J.
W72-06761

LOW TEMPERATURE TESTS ON LEUPOLD AND STEVENS TYPE A-35 RECORDERS AND RECORDER CLOCKS,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
E. F. Chapman.
Technical Bulletin No 54, 1971. 10 p, 5 tab.

Descriptors: *Stream gages, *Instrumentation, *Cold regions, *Cold resistance, Testing, Methodology, Gaging stations, Flow meters, Logging (Recording), Automation, Water levels.
Identifiers: Recorders, Chart drive mechanisms, Clock mechanism, Cold-weather effects.

Low temperature tests on automatic water storage recording equipment used by the Water Survey of Canada are described. The tests show that new Leupold and Stevens, type A-35, negator-spring driven recorders are reliable to -40 deg. F. The major cause of recorder stoppage in cold weather is the congealing of oil in the clock escapement and balance wheel, rather than the increased friction of the paper-drive mechanism. Clocks which stop due to cold temperatures normally will not start when warmed but will remain with the escapement in a locked condition until the pressure is relieved manually. Recorders which are chilled rapidly will cease to operate at a relatively higher temperature than those which are cooled slowly. Improper servicing of the clocks intended for recorders in extreme cold conditions can also be a significant contributor to unsatisfactory operation. (Woodard-USGS)
W72-06775

MULTISPECTRAL PHOTOGRAPHIC REMOTE SENSING OF COASTAL ENVIRONMENTS,
Long Island Univ., Greenvale, N.Y. C. W. Post Center.
E. Yost, R. Anderson, R. Kalia, V. Posteraro, and S. Wenderoth.
Available from NTIS, Springfield, Va. 22151 as AD-733 691, $6.00 paper copy, $0.95 microfiche. Science Engineering Research Group Technical Report SERG TR-11, July 31, 1971. 352 p, 145 fig, 23 tab, 18 ref, 6 append.NR 387-041, ONR Contract No 0014-68-A-0284-0001.

Descriptors: *Remote sensing, *Aerial photography, *Surface waters, *Environmental gradient, Coasts, Bays, Shores, Estuaries, Analytical techniques, Water analysis, Sediment transport, Suspended solids, Radiation, Turbidity, Color, Biota, Geomorphology.
Identifiers: *Multispectral photography.

Experiments to determine the usefulness of multispectral photography for the remote sensing of coastal water environments were conducted in (1) northeastern Massachusetts, (2) Long Island, New York, and (3) Barataria Bay, Louisiana. Multispectral imagery was associated with in situ spectra and water sample analysis simultaneously obtained. Changes in the amplitude and shape of both the downwelling irradiance spectra and upwelling radiance spectra were found to be associated with the amount and type of particulant in suspension. Water penetration in coastal water having in excess of about 1500 particles per cubic centimeter suspended particulant was best between 550 and 600 mm. Narrow spectral bands gave better performance than broad spectral bands. By choosing conditions when the surface deformation of the water was slight and times when the solar glitter from the water surface was minimal, underwater geological features of three northern New England estuaries were identified in the multispectral imagery. Surface salt-fresh water contacts were remotely detected in the Merrimack Estuary, Massachusetts, and the Mississippi Delta, principally due to the difference in suspended particulant on both sides of the contacts. (Woodard-USGS)
W72-06797

FIELD RADIOMETRIC DETERMINATIONS OF SOIL MOISTURE AND DENSITY (POLEVAYA RADIOMETRIYA VLAZHNOSTI I PLOTNOSTI POCHVO-GRUNTOV),
For primary bibliographic entry see Field 02G.
W72-06811

A CORING DEVICE FOR UNCONSOLIDATED LAKE SEDIMENTS,
Federal Water Pollution Control Administration, Athens, Ga. Southeast Water Lab.
R. F. Schneider.
Water Resources Research, Vol. 5, No. 2, p 524-526, April, 1969. 1 fig, 4 ref.

Descriptors: *Lake sediments, *Sediment, *Cores, Sampling, Lakes, Ponds, Pipes, Pistons, *Bottom sampling.
Identifiers: *Livingston Corer.

A piston-type coring device for unconsolidated bottom deposits is described. The apparatus is a modification of the lightweight Livingstone corer. The coring tube is clear plastic, allowing visual examination of the core before extrusion, and the piston contains a vacuum release tube to prevent expansion of the cored material during removal of the piston. It is easily constructed, requires no special machining, and is relatively inexpensive compared with similar coring devices. (Skogerboe-Colorado State)
W72-06831

ZERO PADDING AS A MEANS OF IMPROVING DEFINITION OF COMPUTED SPECTRA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
R. F. Henry, and P. W. V. Graefe.
Manuscript Report Series No 20, 1971. 10 p, 4 fig, 1 ref.

Descriptors: *Oceanography, *Fourier analysis, *Spectroscopy, *Remote sensing, Analytical techniques, Bays, Coasts, Inlets (Waterways), Mathematical studies.
Identifiers: Spectral analysis, Fourier transformation, Zero padding.

A mathematical method is described for facilitating the accurate determination of the frequencies of periodic components in oceanographic records. This method of data modification in conjunction with the Fast Fourier Transform provides a detailed picture of the frequency content of a sampled time signal and thus improves the accuracy with which the positions of spectral peaks can be determined. Also discussed is the use of zero-padding in the accurate computation of Fourier transforms of functions which are non-zero over a finite interval. (Woodard-USGS)
W72-06924

TURBIDITY MEASUREMENT,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
For primary bibliographic entry see Field 02J.
W72-07000

COMPUTATION OF FLUVIAL-SEDIMENT DISCHARGE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02J.
W72-07002

DETERMINATION OF MOISTURE CONTENT WITH A GAMMA BACKSCATTER DENSITY GAUGE,
University of Strathclyde, Glasgow (Scotland). Dept. of Electronic Science.
For primary bibliographic entry see Field 02G.
W72-07005

MEASUREMENT OF PLANT COMMUNITY COVER FROM AERIAL PHOTOGRAPHS USING EKTACHROME INFRARED AERO FILM,
Geological Survey, Tucson, Ariz.
R. M. Turner.
In: Third Annual Earth Resources Program Review, December 1-3, 1970, Houston, Texas, Vol 3, Hydrology and Oceanography; National Aeronautics and Space Administration Manned Spacecraft Center Report MSC-03742, p 50-1-50-8, 1971. 3 fig, 2 ref.

Descriptors: *Hydrogeology, *Remote sensing, *Aerial photography, *Arid lands, *Arizona, Vegetation, Phreatophytes, Color, Plant pigments, Evaporation, Evapotranspiration, Analytical techniques, Water resources development.
Identifiers: *Infrared photography.

Color-IR (infrared aerial photographs of arid-zone vegetation were used to estimate the amount of green plant material on the ground. The purpose was to estimate plant cover as it varies with time and space and relate this vegetative measure to hydrologic conditions. Aerial photographs of the 6,000-acre target area were taken periodically for 3 years (1968-70). The study site is a 15-mile reach of the Gila River valley, San Carlos Indian Reservation, Arizona and is part of the U.S. Geological Survey's Gila Rover Phreatophyte Project. By determining plant volume from the photographs, the evapotranspiration values may be partitioned into portions attributable to transpiration and to soil evaporation. (Woodard-USGS)

W72-07006

CALIBRATING THE SNOW PARTICLE COUNTER FOR PARTICLE SIZE AND SPEED,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02C.
W72-07067

AUTOMATIC DEVICE FOR RECORDING TEST DATA,
Higher Inst. of Chemical Technology, Sofia (Bulgaria).
D. P. Panchovskii.
Zavodskaya Laboratoriya, Vol. 37, No. 5, p 780-781, May 1971. 3 fig.

Descriptors: *Instrumentation, *Monitoring, Cameras, Measurement, Automation, Photography, Mechanical equipment, Electrical equipment.
Identifiers: *Recording systems, Lamps, Instrument reading, Recorders.

A device which automatically records instrument readings during long-term laboratory tests on materials consists of a rotating movie camera, illuminating lamps, program mechanism, and an electric motor. At given, predetermined intervals, a timing mechanism imparts a pulse to switch on the electric motor which, through a reducing gear, rotates the movie camera. The lamps are simultaneously switched on to illuminate the instruments being photographed. As the camera is aligned on each instrument it is switched on and several frames of film are exposed. Complete rotation of the camera comprises a cycle, after which the camera stops in its original position, the lamps are switched off, and the device is ready for another cycle. During each cycle, the time on a conventional clock is photographed as well as the instrument readings. The device is designed for use in a nonprogrammed recording cycle and can also be stopped at will opposite a required section of the apparatus for recording instrument readings over a given test run. (Mortland-Battelle)
W72-07153

METHODS AND INSTRUMENTS. SOME RESULTS OF USING AN UNDERWATER LABORATORY IN OCEANOGRAPHIC RESEARCH,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
N. A. Aybulatov, P. A. Borovikov, G. G. Obdirkin, and V. S. Yastrebov.
Okeanologiya, Vol 11, No 2, p 255-258, 1971.

Descriptors: *Instrumentation, *Methodology, *Sea water, *Physical properties, *Biological properties, Oceanography, Hydrologic data, Benthic fauna, Analytical techniques, Benthic flora, Geomorphology, Solar radiation, Optical properties, Marine plants, Hydrogeology, Automation.
Identifiers: *Underwater laboratory, Biocenoses, Hydro-optical data, Cystoseria, Noctiluca, Polarimeter.

The first Soviet experiments in long-term underwater oceanological investigations with the manned underwater laboratory Chernomor are summarized. Brief descriptions are given of the laboratory itself, of the operational area and of the scientific studies made. Over a period of about one month, five crews of the laboratory carried out hydro-optical, hydrological, geological and biological observations, both visually and with instruments, at depths of 12-14 m. The results are discussed briefly. (Holoman-Battelle)
W72-07164

SPECTROCHEMICAL PERFORMANCE OF A COMPUTER-CONTROLLED DIRECT READING SPECTROMETER,
Rank Precision Industries Ltd., London (England). Analytical Div.
K. P. Rippon.
Proceedings of the Society for Analytical Chemistry, Vol 8, No 11, p 232-235, November 1971.

Descriptors: *Instrumentation, *Automatic control, Automation, Data processing, Digital computers, Spectrometers, Trace elements, Analytical techniques, Control systems.
Identifiers: Minicomputers, Recorders.

Using an example of spectroscopic analysis of high-alloy material, the feasibility and advantages of replacing sections of analytical instruments with small digital computers are demonstrated. This does not significantly increase cost, and, in the case discussed, improves analytical accuracy. The computer not only carries out calculations that would be slow and inconvenient on an off-line system, but also controls and optimizes the analytical process. An actual application of this philosophy is the E1000 1.5-m Polyvac, in which the electronic console is almost entirely replaced by a small computer that controls the entire analytical sequence. The operator uses virtually no knobs and exercises control solving by typing commands into the teleprinter keyboard. (Mortland-Battelle)
W72-07173

SOME SAMPLING PROBLEMS IN FISHERY WORK,
Instituto de Fomento Pesquero, Santiago (Chile).
Patrick K.Tomlinson.
Biometrics. 27 (3): 631-641. 1971.
Identifiers: Anchovies, Fishery, Models, Sampling, Statistical.

Methods are discussed for sampling commercial fisheries using 2-stage subsampling with primary units of unequal size sampled with equal probabilities. The emphasis is on practical application to fisheries which operate mainly on small species such as anchovies. Two examples taken from real situations are used to illustrate the techniques and expose some of the inherent problems.--Copyright 1972, Biological Abstracts, Inc.
W72-07267

A CONSTANT-FRACTION SAMPLING DEVICE FOR ENUMERATING JUVENILE SALMONIDS,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
William E. Davis.
Progr Fish Cult. 33 (3): 180-183. 1971. Illus.
Identifiers: Constant, Device, Enumerating, Fraction, Juvenile, Oncorhynchus-Gorbuscha, Oncorhynchus-Nerka, Salmonids, Sampling.

A device is described for enumerating a downstream migrating fry population by accurately sampling a constant, small fraction of the migration. The device is circular, 4 feet in diameter, with revolving scoops to sample fry in an upwelling flow of 1 to 3 cfs screened from a spawning channel with a flow of 40 cf Sockeye (Oncorhynchus nerka) and pink salmon (O. gorbuscha) fry have been enumerated successfully with this sampler and recent tests indicate that the device can be adapted to enumerate seaward migrant sockeye smolts in a small stream where the necessary head is available.--Copyright 1972, Biological Abstracts, Inc.
W72-07272

SAMPLING GEAR FOR LARVAL RESERVOIR FISHES,
Bureau of Sport Fisheries and Wildlife, Fayetteville, Ark. South Central Reservoir Investigations.
Norval F. Netsch, Alfred Houser, and Louis E.Vogele.
Progr Fish Cult. 33 (3): 175-179. 1971. Illus.
Identifiers: Fishes, Gear, Larval, Reservoir, Sampling.

A description is presented of gear that has been successfully used to quantitatively sample larval fishes in reservoirs. The boat is 20 ft in length and is powered with a 120-hp stern drive unit. A stanchion assembly and a gasoline-powered winch are used to facilitate handling of a planing type depressor and a 1-m diameter, cone-shaped, 1/32-in mesh net. Depth is predetermined by the angle and amount of cable payed out. Standardized hauls are made by towing at a constant rpm and time. Seventeen fish spp. were taken with their gear from 2 upper White River reservoirs. Major sources of bias are that sampling is limited to open water, no means of closing the net while it is being set or retrieved is provided, and that surface hauls are made in the prop wash directly behind the boat.--Copyright 1972, Biological Abstracts, Inc.
W72-07278

7C. Evaluation, Processing and Publication

METHODS OF ANALYSIS AND DETERMINATION OF EFFECTS OF ALTERNATIVE USES OF FORESTED LAND ON STREAMFLOW,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 04C.
W72-06606

ESTUARIES, BAYS AND COASTAL CURRENTS AROUND PUERTO RICO,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
Ernesto F. Colon.
Available from the National Technical Information Service as PB-208 027, $3.00 in paper copy, $0.95 in microfiche. Partial Completion Report 6, UPRICO-WRRI-PR-71-31-6, September 1971, 22 p. OWRR A-031-PR (7).

Descriptors: Coasts, Ocean currents, *Bays, *Estuaries, *Data collection, *Puerto Rico, *Measurement, Instrumentation, Water temperature, Volume, Velocity, *Current meters, Currents (Water).

Three model 502 In-situ current direction, temperature, and velocity meters, manufactured by Hydro Products in California were used simultaneously in a triangular pattern or in line. In some cases, all three instruments were used vertically at different depths. A one half moon cycle period was taken for each station and a continuous recording was obtained for all three measurements. The data are shown by vectors every 10 degrees on a magnetic rose and in tabular form indicating the relative volume of water passing through the station every 10 degrees during the entire study.
W72-06609

EFFECT OF GEOGRAPHICAL LOCATION ON COOLING POND REQUIREMENTS AND PERFORMANCE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 05G.
W72-06618

A SYNOPTIC STUDY FOR EVALUATING THE ROLE OF THE GREAT LAKES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 02H.
W72-06689

THE APPLICATION OF THE ANALYSIS OF VARIANCE TO MEAN AREAL RAINFALL ESTIMATION,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 02B.
W72-06694

MAPS OF UPPER AIR CURRENTS ABOVE THE EARTH,
Nauchno-Issledovatelskii Institut Aeroklimatologii, Moscow (USSR).
For primary bibliographic entry see Field 02B.
W72-06732

VARIATIONS OF EXISTING GLACIERS.
For primary bibliographic entry see Field 02C.
W72-06769

MAPS OF THE WATERSHEDS OF THE SANTA MARGARITA AND SAN LUIS REY RIVERS, RIVERSIDE AND SAN DIEGO COUNTIES, CALIFORNIA SHOWING GROUND-WATER QUALITY DATA, 1971,
Geological Survey, Washington, D.C.
G. A. Irwin, and F. W. Geissner.
Geological Survey Open-file Maps Report, 1971. 7 sheets, 10 map.

Descriptors: *Groundwater, *Water wells, *Water quality, *Maps, *California, Geology, Chemical analysis, Dissolved solids, Sodium, Potassium, Magnesium, Calcium, Bicarbonates, Chlorides, Nitrates, Sulfates.
Identifiers: *San Luis Rey River watershed (Calif), *Santa Margarita River watershed (Calif), *Riverside County (Calif), San Diego County (Calif).

Ten maps on 7 sheets present water-quality data of groundwater for the watersheds of the Santa Margarita and San Luis Rey Rivers, Riverside and San Diego Counties, California for the year 1971. Shown in the maps are generalized geology; locations of active wells; and chemical compositions of the well waters including dissolved solids, sodium, potassium, magnesium, calcium, bicarbonate, chloride, nitrate, and sulfate. (Woodard-USGS)
W72-06770

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1970,
Geological Survey, Austin, Tex.
H. D. Buckner.
Geological Survey Texas District Open-file Report, January 1972. 9 p, 1 fig.

Descriptors: *Data collections, *Streamflow, *Reservoir storage, *Texas, Lakes, Rainfall-runoff relationships, Stream gages, Hydrologic data, Statistics, On-site data collections, Rain gages.
Identifiers: Trinity River basin (Tex), Mountain Creek (Tex), Lake gage.

The records of streamflow and reservoir content for the 1970 water year are presented in a form which facilitates their use in detailed analyses of the basin hydrologic system. A stream-gaging station was first established in Mountain Creek Watershed in March 1925 and operated until July 5, 1933, when it was discontinued. Daily streamflow records are published in the annual series of Geological Survey Water-Supply Papers beginning in 1925; monthly and yearly summaries are in WSP 1312. In October 1960 hydrologic data collection was resumed with establishment of three gaging stations and one reservoir-content station. Data are published in the Texas annual reports for the 1961-70 water years. For the 1970 water year, basin outflow was 90,590 acre-ft. Storage in the lake increased by 2,570 acre-ft. Rainfall over the 304 sq mi watershed was 39 in, which is 5 in more than the long-term mean. Streamflow and reservoir-content records are given for the gaging sites for 1970. (Lang-USGS)
W72-06774

PROBABILITY FORECASTS OF WATER SURFACE TEMPERATURES OF THE ST. LAWRENCE RIVER BETWEEN KINGSTON, ONTARIO AND SOREL, QUEBEC,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 04A.
W72-06778

COMPUTER PROGRAMS IN USE IN THE WATER QUALITY DIVISION, VOL. 3,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
A. Demayo, and P. D. Goulden.
Report Series, No. 16, 1971. 33 p, 9 fig, 9 tab, 6 ref.

Descriptors: *Computer programs, *Water quality, *Systems analysis, *Input-output analysis, *Computers, Computer models, Numerical analysis, Data processing, Methodology, Programming languages.
Identifiers: *Canada.

Two computer programs used to process water quality data from a Data System for Technicon CSM-6 AutoAnalyzer are described. This data system was developed in the Water Quality Division of the Inland Waters Branch, Canada. Because of the memory size restrictions the complete program had to be divided into two parts. In version I the intermediate data are stored on punched paper tape. Version II was written for PDP-8/L-8K computers equipped with Tennecomp magnetic tape cartridge system. In this version the intermediate data are stored on magnetic tape. (Woodard-USGS)
W72-06780

GENERATION AND TESTING OF RANDOM NUMBERS,
Geological Survey, Washington, D.C.
N. C. Matalas, and M. S. Hellmann.
Geological Survey Computer Contribution No 8, 1971. 17 p, 5 tab, 8 ref.

Descriptors: *Computer programs, *Hydrology, *Computers, *Statistical methods, *Numerical analysis, Programming languages, Computer models, Reviews.

Mathematical techniques developed by the Water Resources and Computer Center Division of the U.S. Geological Survey are presented for generating numbers having specified underlying probability distributions. These techniques operate on the basic sequence of numbers that are uniformly distributed on the interval (0,1). Various statistical tests are applied to sets of numbers generated by The RANDU and GAUSS subroutines which are supplied by IBM as part of the System/360 FORTRAN Scientific Subroutine package. The tests indicate that the numbers generated by RANDU can be used with appropriate transformations to obtain numbers following specified distributions. The numbers generated by GAUSS are serially uncorrelated within the statistical limits of testing at the 0.95 and 0.99 probability levels. (Woodard-USGS)
W72-06790

HYDROGEOLOGIC DATA FOR THE UPPER CONNECTICUT RIVER BASIN, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 04B.
W72-06792

OPERATIONAL HYDROMET DATA MANAGEMENT SYSTEM--DESIGN CHARACTERISTICS.
North American Rockwell Information Systems Co., Anaheim, Calif.
For primary bibliographic entry see Field 07A.
W72-06793

WATER RECORDS OF PUERTO RICO, 1964-67: VOLUME 2--SOUTH AND WEST SLOPES,
Geological Survey of Puerto Rico, San Juan.
J. G. Rickher.
Available from USGS, Bldg 652, Ft Buchanan, P. R. 00934. Geological Survey Data Report, 1970. 308 p, 3 ref.

Descriptors: *Hydrologic data, *Groundwater, *Surface waters, *Water analysis, *Puerto Rico, Basic data collections, Streamflow, Stream gages, Flow rates, Sediment transport, Water wells, Water levels, Water quality, Chemical analysis, Water properties.

The surface-water, quality-of-water, and groundwater records for the south and west slopes of Puerto Rico for calendar years 1964 through 1967 are presented. Included are records for streamflow stations, water levels in wells, and the chemical and physical characteristics of streamflow and ground water. The location of all observation stations, except miscellaneous stations is shown on maps of river basins and areas adjoining the basins. Each map is followed by the water records in the particular basin and area shown on the map. The records were collected by the Carribean District of the Water Resources Division, U.S. Geological Survey, in financial cooperation with agencies of the Commonwealth of Puerto Rico. (Woodard-USGS)
W72-06798

HYDROLOGY OF TWO SMALL RIVER BASINS IN PENNSYLVANIA BEFORE URBANIZATION,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W72-06912

SELECTED DIGITAL COMPUTER TECHNIQUES FOR GROUNDWATER RESOURCE EVALUATION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 02F.
W72-06914

A TECHNIQUE FOR SMOOTHING RIVER FLOWS DURING HYDROELECTRIC POWER PRODUCTION,
Auckland Univ., (New Zealand). Dept. of Theoretical and Applied Mechanics.
For primary bibliographic entry see Field 04A.
W72-06982

MATHEMATICAL MODELS, EXAMPLES OF SOME SYSTEMS ANALYSIS TECHNIQUES.
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06A.
W72-06987

DATA AND ANALYSIS.
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06A.
W72-06988

A DIGITAL SIMULATION OF THE DYNAMIC SOIL MOISTURE STATUS,
Mississippi Agricultural Experiment Station, State College.
For primary bibliographic entry see Field 02G.
W72-07003

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 1.--NORTH ATLANTIC SLOPE BASINS.
Geological Survey, Washington, D.C.

Geological Survey Circular 651, 1971. 89 p, 1 fig, 1 tab.

Descriptors: *Hydrologic data, *Data collections, *Surface waters, *Documentation, Streamflow, Gaging stations, Flow measurement, Frequency, Reservoirs, Sites, Peak discharge, Low flow, Water levels.
Identifiers: *North Atlantic slope basins, Drainage areas, Data collection periods.

Streamflow and reservoir stations are listed for the North Atlantic slope basins for which records

have been or are to be published in reports of the Geological Survey for periods through September 30, 1970. This index includes drainage areas and periods of data collections at continuous-record gaging stations, crest-stage partial-record stations, and low-flow partial-record stations. A continuous-record station is a gaging station on a stream or reservoir for which the discharge, stage, or contents is published on a daily, weekly, or monthly basis for a continuous period of time. A crest-stage partial-record station is a streamflow station for which only the annual maximum discharge is published over a period of years for use in flood-flow analyses. A low-flow partial-record station is a streamflow station for which only discharge measurements made at base flow are published. (Woodard-USGS)
W72-07011

INDEX TO SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 3.--OHIO RIVER BASIN.
Geological Survey, Washington, D.C.

Available free on application to USGS, Washington, D.C. 20242. Geological Survey Circular 653, 1971. 71 p, 1 fig, 1 tab.

Descriptors: *Hydrologic data, *Data collections, *Surface waters, *Ohio River, *Documentation, Streamflow, Gaging stations, Flow measurement, Frequency, Reservoirs, Sites, Peak discharge, Low flow, Water levels.
Identifiers: *Ohio River basin, Drainage areas, Data-collection periods.

Streamflow and reservoir stations are listed for the Ohio River basin for which records have been or are to be published in reports of the Geological Survey for periods through September 30, 1970. This index includes drainage areas and periods of data collections at continuous-record gaging stations, crest-stage partial-record stations, and low-flow partial-record stations. A continuous-record station is a gaging station. (Woodard-USGS)
W72-07012

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 5--HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS.
Geological Survey, Washington, D.C.

Available free on application to USGS, Washington, D.C. 20242. Geological Survey Circular 655, 1971. 65 p, 1 fig, 1 tab.

Descriptors: *Hydrologic data, *Data collections, *Surface waters, *Mississippi River basin, *Documentation, Streamflow, Gaging stations, Flow measurement, Frequency, Reservoirs, Sites, Peak discharge, Low flow, Water levels.
Identifiers: *Upper Mississippi River basin, *Hudson Bay, Drainage areas, Data-collection periods.

Streamflow and reservoir stations are listed for the Hudson Bay and Upper Mississippi River basins for which records have been or are to be published in reports of the Geological Survey for periods through September 30, 1970. This index includes drainage areas and periods of data collections at continuous-record gaging stations, crest-stage partial-record stations, and low-flow partial-record stations. A continuous-record station is a gaging station. (Woodard-USGS)
W72-07013

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 11.--PACIFIC SLOPE BASINS IN CALIFORNIA.
Geological Survey, Washington, D.C.

Available free on application to USGS Washington, D.C. 20242. Geological Survey Circular 661, 1971. 53 p, 1 fig, 1 tab.

Descriptors: *Hydrologic data, *Data collections, *Surface waters, *California, *Documentation, Streamflow, Gaging stations, Flow measurement, Frequency, Reservoirs, Sites, Peak discharge, Low flow, Water levels.
Identifiers: *Pacific slope basins (Calif), Drainage areas, Data-collection periods.

Streamflow and reservoir stations are listed for the Pacific slope basins in California for which records have been or are to be published in reports of the Geological Survey for periods through September 30, 1970. This index includes drainage areas and periods of data collections at continuous-record gaging stations, crest-stage partial-record stations, and low-flow partial-record stations. A continuous-record station is a gaging station. (Woodard-USGS)
W72-07014

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 12. PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN.
Geological Survey, Washington, D.C.

Available free on application to U.S. Geol. Survey, Wash DC 20242. Geological Survey Circular 662, 1971. 40 p, 1 fig.

Descriptors: *Hydrologic data, *Data collections, *Surface waters, *Documentation, Drainage area, Streamflow, Gaging stations, Flow measurement, Frequency, Reservoirs, Sites, Peak discharge, Low flow, Water levels, Washington.
Identifiers: *Pacific slope basins (Wash), *Columbia River basin, Data-collection periods.

Streamflow and reservoir stations are listed for the Pacific slope basins in Washington and upper Columbia River basin for which records have been or are to be published in reports of the Geological Survey for periods through September 30, 1970. This index includes drainage areas and periods of data collections at continuous-record gaging stations, crest-stage partial-record stations, and low-flow partial-record stations. A continuous-record station is a gaging station. (Woodard-USGS)
W72-07015

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 13. SNAKE RIVER BASIN.
Geological Survey, Washington, D.C.

Available free on application to U.S. Geological Survey, Wash., D.C. 20242. Geological Survey Circular 663, 1971. 29 p, 1 fig.

Descriptors: *Hydrologic data, *Data collections, *Surface waters, *Idaho, *Documentation, Drainage area, Streamflow, Gaging stations, Flow measurement, Frequency, Reservoirs, Sites, Peak discharge, Low flow, Water levels.
Identifiers: *Snake River basin (Idaho and bordering states), Data-collection periods.

Streamflow and reservoir stations are listed for the Snake River basin in Idaho and bordering states for which records have been or are to be published in reports of the Geological Survey for periods through September 30, 1970. This index includes drainage areas and periods of data collections at continuous-record gaging stations, crest-stage partial-record stations, and low-flow partial-record stations. A continuous-record station is a gaging station. (Woodard-USGS)
W72-07016

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 14. PACIFIC SLOPE BASINS IN OREGON AND LOWEK COLUMBIA RIVER BASIN.
Geological Survey, Washington, D.C.

Available free on application to U.S. Geol. Survey, Wash., D.C., 20242. Geological Survey Circular 664, 1971. 31 p, 1 fig.

Descriptors: *Hydrologic data, *Data collections, *Surface waters, *Oregon, *Documentation, Drainage area, Streamflow, Gaging stations, Flow measurement, Frequency, Reservoirs, Sites, Peak discharge, Low flow, Water levels.
Identifiers: *Pacific slope basins, *Lower Columbia River basin, Data-collection periods.

Streamflow and reservoir stations are listed for the Pacific slope basins in Oregon and Lower Columbia River basin for which records have been or are to be published in reports of the Geological Survey for periods through September 30, 1970. This index includes drainage areas and periods of data collections at continuous-record gaging stations, crest-stage partial record stations, and low-flow partial-record stations. A continuous-record station is a gaging station. (Woodard-USGS)
W72-07017

SIMULATION OF LONG WAVES IN BRANCHING WATERWAYS,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 02E.
W72-07019

WATER RESOURCES DATA FOR TEXAS: PART 2. WATER QUALITY RECORDS, 1969.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 05A.
W72-07029

DAILY TEMPERATURES AND PRECIPITATION FOR SUBALPINE FOREST, CENTRAL COLORADO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02B.
W72-07079

SYSTEM FOR MEASURING AND COMPUTING EPHEMERAL RUNOFF FROM SMALL WATERSHEDS,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
For primary bibliographic entry see Field 02E.
W72-07082

A COMPUTER PROGRAM FOR COMPUTING STREAMFLOW VOLUMES,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02E.
W72-07083

A SPORADIC MONITORING AND CONTROL SYSTEM,
D. I. Ageikin, Yu. T. Knopov, and N. N. Kuznetsov.
Pribory i Sistemy Upravleniya, No. 4, p 32-35, April 1970. 5 fig, 3 ref.

Descriptors: *Control systems, *Computers, *Automatic control, Automation, Monitoring, Digital computers, Analog computers.
Identifiers: *Sporadic control system, Converters, Digital to analog converters, Systems analysis.

Experience has shown that even at the highest level of automation, the human operator is still the main link in the control system. However, with the growing complexity of control systems for technological processes, the increased number of controlled parameters, and the limited ability of a human operator to process information, more sophisticated control systems are needed. Sporadic control systems are proposed for continuously operating processes whose parameters have par-

ticular zones of permissible values and where emergency situations arise when one or more parameters lie outside these zones. In a sporadic control system, the operator receives signals that parameters have exceeded set limits, just as in other systems. By inserting particular perturbations into the system, the operator can simultaneously displace the settings of all, or a group of, the controlled parameters. By altering the perturbations through calibrated knobs, the operator obtains information about the state of the entire group of parameters, which is sufficient for decision making or forecasting. Several advantages of such a system are discussed and several possible forms of the system are diagrammed and described. (Mortland-Battelle)
W72-07152

A FLEXIBLE COMPUTER PROGRAM FOR CALCULATIONS IN EMISSION-SPECTROGRAPHIC ANALYSIS,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 05A.
W72-07161

STATISTICAL EVALUATION OF THE RESULTS OBTAINED BY QUANTITATIVE REDUCTION OF A BIOLOGICAL SAMPLE,
All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
For primary bibliographic entry see Field 05A.
W72-07165

AUTOMATIC RECOGNITION OF MUSKEG FROM AERIAL PHOTOGRAPHS,
New Brunswick Univ., Fredericton. Dept. of Surveying Engineering.
D. F. Woolnough.
Photogrammetria, Vol 28, No 1, p 17-25, February 1972. 5 fig, 9 ref.

Descriptors: *Photogrammetry, *Digital computers, *Data processing, *Mapping, *Muskeg, Canada, Computer programs, Remote sensing, Aerial photography, Terrain analysis, Surveys.

Panchromatic photographs of areas of muskeg in New Brunswick were measured with a microdensitometer, and the region photographed was divided into muskeg and non-muskeg by a digital computer program. A computer-produced map and a mathematical analysis were used to show not only the best choice of parameters, but also how good this choice is, and how good the division is. The effect of external factors on the photographic density is discussed, and a comparison between the results obtained by normal and dodged printing is made. Automatic interpretation of features of the natural landscape on panchromatic photographs using textural analysis is possible with some accuracy, and would be improved if controlled photography were available. (Knapp-USGS)
W72-07226

AUTOMATIC INSTRUMENTATION FOR TELEMETERING RAIN AND RIVER-LEVEL DATA FROM REMOTE STATIONS,
For primary bibliographic entry see Field 02A.
W72-07244

THE COMPUTATION AND FORECASTING OF MAXIMUM FLOOD DISCHARGES,
For primary bibliographic entry see Field 02A.
W72-07245

08. ENGINEERING WORKS

8A. Structures

MUD GULCH FLOOD PREVENTION PROJECT MEASURE, SANGRE DE CRISTO RC AND D PROJECT, COLORADO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-199 654-F, $3.00 in paper copy, $0.95 in microfiche. May 28, 1971. 14 p.

Descriptors: *Colorado, *Flood protection, *Environmental effects, Dams, Habitats, Water injury, Spillways, Channel improvement, Sediment control, Flood control, Flood damage, Structures, Bodies of water, Water quality, Stabilization, Dam construction.
Identifiers: *Environmental impact statements.

The planned structural measure consists of one floodwater retarding structure. The environmental impacts of the proposed flood control project include the elimination of flood damage to 18 homes, 4 businesses, county and state highways and 273 acres of agricultural land; and improved water quality through reduced channel degradation and sediment loads. Adverse environmental effects include the disturbance of approximately 20 acres of rangeland during construction of the dam and spillway and temporary flooding of approximately 30 acres of rangeland in the flood retarding pool during flood periods. Alternatives included the following: (1) enlargement of Mud Gulch Channel which would disturb several miles of habitat for game, songbirds, and small mammals and cause considerable erosion and degradation in the channel; and (2) permit the area to remain in its present condition, subject to periodic flood damage to homes, businesses, roads, bridges, and agricultural land. The comments of concerned agencies are attached. (Grant-Florida)
W72-06642

WAIKIKI BEACH (KUHIO BEACH SECTOR), OAHU, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.

Available from the National Technical Information Service as PB-199 892-F, $3.00 in paper copy, $0.95 in microfiche. May 27, 1971. 30 p, 2 fig, 1 tab.

Descriptors: *Hawaii, *Beach erosion, *Shore protection, *Environmental effects, *Coastal engineering, Beaches, Coasts, Recreation facilities, Coastal structures, Abutments, Sea walls, Turbidity, Marine animals.
Identifiers: *Environmental impact statements, *Waikiki Beach (Hawaii).

Approximately 1500 feet of Waikiki Beach will be improved by the placement of sand, the construction of an additional groin, the rehabilitation of an existing groin, and the construction of a promenade. Beach improvements, where the beach is narrow or non-existent, and the best possible use of the environment would be provided by the project. Some marine life would be buried and turbidity in nearshore waters would be increased. Structural alternatives included extension of the Kapahulu Storm Drain, removal of crib walls, and construction of a groin at the north end of the beach. Strong opposition to such alternatives was received from local groups. Comments received from various agencies and organizations are included. (Earl-Florida)
W72-06643

KANEOHE-KAILUA AREA, OAHU, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.

Available from the National Technical Information Service as PB-201 313-F, $3.00 in paper copy, $0.95 in microfiche. July 1971. 18 p.

Descriptors: *Federal project policy, *Flood control, *Hawaii, *Environmental effects, Project planning, United States, Federal government, State governments, Administrative agencies, Competing uses, Economics, Water resources development, Project benefits, Project purposes, Cost-benefit analysis, Channel improvement, Dams, Recreation, Aesthetics, Reservoirs, Recreation facilities, Environmental engineering, Construction, Silting.
Identifiers: *Environmental impact statements, *Oahu (Hawaii).

The proposed flood control project consists of a detention dam and reservoir in the headwaters of Kaneohe Stream and allied channel improvements at the stream outlet on the Pacific Ocean. The project would provide standard project flood protection and would allow utilization of surrounding lands for recreational purposes. Among the environmental impacts of the proposed action would be replacement of approximately 35 acres of naturally vegetated land and substitution of a permanent pool for several small streams. Adverse environmental effects include intrusion of a dam structure into the natural setting and the effects of construction, including: (1) an increased sediment load during periods of high flow, (2) disturbances to natural vegetation, and (3) the impact of construction activities on nearby communities. The alternatives are to forego the project or to use a concrete rectangular channel. Comments and suggestions received from Hawaii and federal departments are included. (Johnson-Florida)
W72-06644

FLOOD CONTROL IMPROVEMENT ON ESOPUS CREEK AT KINGSTON, NEW YORK; HUDSON RIVER, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.

Available from the National Technical Information Service as PB-200 543-F, $3.00 in paper copy, $0.95 in microfiche. July 1, 1971. 21 p, 2 fig.

Descriptors: *Flood protection, *Flood control, *Environmental effects, *Hudson River, Levees, Human population, Land use, Water control, Wildlife conservation, New York, Cost-benefit analysis, Construction, Federal government, Flood proofing.
Identifiers: *Environmental impact statements, *Esopus Creek (NY).

The proposed improvement is designed to provide flood protection for lands along the right bank of Esopus Creek, including a shopping center and an urban renewal project. Works will consist of 1,667 feet of levees and 872 feet of floodwalls. The benefit-cost ratio is 1.2 to 1.0. The area is an alluvial valley with stream meanders and flat valleys. The project will enhance land values and permit use of land for urban renewal. Beautification measures include the planting of trees and shrubbery. Improvements will not significantly affect fish and wildlife; however, fish and wildlife enhancement is not anticipated. Adverse environmental effects include the removal of large trees, restriction of river access, and loss of wetlands. The project, however, will prevent uncontrolled environmental degradation from flooding. Alternatives include reservoir storage space, a diversion tunnel, channel deepening and widening, and flood proofing structures. A 'no-development alternative' would cause environmental losses of $60,000 annually. There will be no significant impact on long-term wildlife habitat productivity. Comments of interested agencies are included. (Earl-Florida)

W72-06645

STONEWALL JACKSON LAKE, WEST FORK RIVER, WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.

Available from the National Technical Information Service as PB-202 980-F, $3.00 in paper copy, $0.95 in microfiche. November 12, 1971. 48 p, 11 tab, 1 chart.

Descriptors: *West Virginia, *Flood control, *Water quality control, *Dam construction, *Environmental effects, Water supply, Recreation facilities, Flood plain zoning, Flood protection, Flood plains, Dams, Lakes, Water resources development, Human population, Wildlife habitats.
Identifiers: *Environmental impact statements, *West Fork River (WVa).

The project encompasses construction of a multiple-purpose concrete dam and lake for flood control, water quality control, water supply, recreational, and other purposes. The benefit-cost ratio is 1.4 without redevelopment and 1.5 with redevelopment. The West Fork Basin is generally mountainous, and bottom lands and adjacent slopes have been cleared for agricultural use. The main environmental impact of Stonewall Jackson Lake would be the inundation of 1,800 acres of crop land, 1,100 acres of pasture, and 400 acres of woodland. About 280 acres of rural land will be completely protected from flooding. Adverse environmental effects include inundation of 2,650 acres of wildlife habitat, elimination of 21 miles of stream fishing, infusion of people into the wildlife habitat, and a negative effect on many human inhabitants. Alternatives include no action, flood plain management, channel improvement, diversion, and a reservoir at an alternative site. The area's long term productivity would be enhanced. The project site will be irreversibly committed for the life of the project. Five public hearings have been held. Comments of concerned agencies are set forth. (Earl-Florida)
W72-06647

LOWER KLAMATH RIVER FLOOD CONTROL PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, San Francisco, Calif.

Available from the National Technical Information Service as PB-201 519-D, $3.00 in paper copy, $0.95 in microfiche. June 1971. 6 p, 1 ref, 3 plate.

Descriptors: *Flood plains, *California, *Flood protection, *Environmental effects, United States, Bank protection, Flood plain zoning, Federal government, Local governments, Legal aspects, Economics, Project planning, Levees, Floods, Project purposes, Riprap, Construction materials, Recreation.
Identifiers: *Environmental impact statements, *Klamath River.

The project includes: (1) flood free areas created by the use of levees at the towns of Klamath and Klamath Glen, (2) bank protection works to stabilize the north bank of the river from erosion due to riverflows, and (3) flood plain management to minimize plain development and habitation. The climatology, economic development, fish and wildlife, water quality, recreational use, and scenic quality of the area's environmental setting are described. The environmental impact of the project includes: (1) slight loss of vegetation and habitats, (2) flood plain preservation for recreational purposes, (3) increased pollution from recreational use, and (4) probable construction of permanent facilities in flood free areas. Adverse effects would be slight with only some loss of natural vegetation and habitat and a possible increase in the mosquito population. Alternatives include evacuation of the entire flood plain, improvement of the existing channel with and without levee construction, upstream reservoir storage, and groins to deflect and control riverflow. (Johnson-Florida)
W72-06650

CORPS OF ENGINEERS CAUGHT UP IN BATTLE OF THE BUILDERS AGAINST THE PRESERVERS,
For primary bibliographic entry see Field 06E.
W72-06653

ENVIRONMENTAL DEFENSE FUND, INC. V. CORPS OF ENGINEERS.
For primary bibliographic entry see Field 06E.
W72-06665

FINITE ELEMENT METHOD: A GALERKIN APPROACH,
British Columbia Univ., Vancouver.
S. G. Hutton, and D. L. Anderson.
Journal of the Engineering Mechanics Division, American Society of Civil Engineers, Vol 97, No EM5, p 1503-1520, Oct 1971. 1 tab, 14 ref, 2 append.

Descriptors: *Finite element analysis, *Stress analysis, Structural analysis.
Identifiers: *Boundary conditions, *Mathematical analysis, Engineering mechanics, Convergence, Functional analysis, Eigenvalues, Canada, Discontinuities.

The finite element method is a means of formulating an approximate solution to a given equation in terms of known coordinate functions and unknown parameters. This approximate solution may be used in conjunction with a number of techniques to determine the unknown parameters. Rayleigh-Ritz and virtual work procedures have commonly been used. The application of a Galerkin method is analyzed and a class of problems defined for which convergence is ensured. This class is wider than that applicable to the Rayleigh-Ritz procedure. Natural boundary conditions are defined, but the Galerkin procedure often does not require the approximating functions to satisfy these conditions. Interelement continuity requirements that are sufficient to ensure convergence are also presented. (USBR)
W72-06737

ANALYSIS OF HORIZONTALLY CURVED BOX GIRDER BRIDGES,
Illinois Inst. of Tech., Chicago; and Consoer, Townsend and Associates, Chicago, Ill.
K-H Chu, and S. G. Pinjarkar.
Journal of the Structural Division, American Society of Civil Engineers, Vol 97, No ST10, p. 2481-2501, Oct 1971. 17 fig, 2 tab, 14 ref, append.

Descriptors: *Bridges (Structures), *Stress analysis, *Structural analysis, Shear stress, Concrete structures, Stress, Structural engineering, Structures, Bridge design.
Identifiers: Shell theory, Stiffness method, Box beams, Displacements, Plates, Diaphragms (Mechanics).

Bridges consisting of horizontal sector plates and vertical cylindrical shell elements are analyzed. Membrane and bending action for the plate and shell elements are considered. Equations are given for determining stiffnesses for sector plate elements. Stiffnesses for the shell element are based on a solution by Hoff. From the equilibrium and compatibility conditions at the joints, unknown displacements are solved and edge forces in plate and shell elements are obtained. Methods of determining membrane stresses, fixed edge forces, and bending moments at interior points of sector plate elements are outlined. A numerical example illustrates an application of the method. The bridge is simply supported at the ends and is provided with diaphragms at the ends only. With span length kept at 120 ft, the bridge was analyzed for 4 different curvatures with mean radius R equal to 100 ft, 200 ft, 300 ft, and infinity (straight bridge). As R decreases, longitudinal stress decreases at the outside edge and increases at the inside edge. A component of torsional moment causes the average longitudinal stress (based on stress area) to increase as R decreases. A comparison of the proposed method with Tung's method for analysis of a curved twin box girder bridge shows poor agreement. (USBR)
W72-06746

THE STRUCTURAL DESIGN OF CIRCULAR DIVERSION, POWER AND PRESSURE TUNNELS.
Thames Polytechnic, Woolwich (England).

Tunnels and Tunnelling, Part I, Vol 3, No 3, p 161-171, May-June 1971; Part II, Vol 3, No 4, p 271-275, July-Aug 1971; Part III, Vol 3, No 5, p 356-359, Sept-Oct 1971. 16 fig, 8 tab, 20 ref, append.

Descriptors: *Tunnel design, *Structural design, *Finite element analysis, Bibliographies, Tunnel linings, Water tunnels (Conveyance), Diversion tunnels, Pressure tunnels, Hydraulic design, Rock pressures, Design criteria, Loads (Forces), Computation, Computer programs, Reinforcement, Stress.
Identifiers: Combined loading, Computer printouts, Great Britain, Steel linings.

Design methods are presented for diversion, power, and pressure tunnels in rock. Three numerical examples are given; two are related to specific projects. Generally, tunnel design is governed by the salient features of hydraulic and structural criteria geared to the individual project and associated problems. Major items for hydraulic criteria are listed, with emphasis on the structural aspects of tunnel design. Terzaghi's empirical values for external loadings are given for structural design computations. These values assume the rock load acts as a uniformly distributed load over the tunnel diameter. Lateral restraint by the surrounding rock is extremely important and must be considered in tunnel lining design. Equations for moments, thrusts and shears in a tunnel lining for combinations of loads are given. The finite element method is introduced to check the conventional design methods. Detail drawings and specifications are given to demonstrate the use and interpretation of analyses and their relationship to practical design requirements. Generally, a 25% savings can be achieved in the total quantity of reinforcement using the finite element technique. (USBR)
W72-06747

ENVIRONMENTAL CONCEPTS FOR MT. ELBERT POWERPLANT,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 06G.
W72-06756

GREAT LAKES REGION INVENTORY REPORT: NATIONAL SHORELINE STUDY.
Corps of Engineers, Chicago, Ill. North Central Div.

Available from the National Technical Information Service as AD-733 470, $3.00 in paper copy, $0.95 in microfiche. National Shoreline Study Report, August 1971. 221 p, 77 fig, 47 photo, 53 tab.

Descriptors: *Beach erosion, *Great Lakes, *United States, *Shore protection, *Lake shores, Storms, Waves (Water), Floods, Runoff, Ice, Water levels, Littoral drift, Breakwater, Sea walls, Costs.
Identifiers: *Erosion damage.

Erosion and the need for protection of the shoreline zone of the United States portion of the Great Lakes are discussed. The principal causes of the erosion involve storms, flooding, lake levels,

wave action, frost and ice action, underground water seepage and surface water runoff. Major storms create the largest changes in the shore. The direction, magnitude, duration of storms, and the fetch length determines wave heights and littoral currents. The estimate of total damage to all shore properties during the period 1951-1952 was $61 million. Of this, wave action cost $50 million. About 215 miles of shoreline has critical erosion where the loss of land, economic losses, and other considerations appear to justify protective measures. The shore protective measures considered are those that provide protection by means of a high beach, shield vulnerable portions of the shores from forces of waves, and reduce or prevent flooding of lower adjacent lands behind such protection sections. These measures include bulkheads, seawalls, revetments, groins, offshore breakwaters, and beach fills. The approximate cost for the protective measures is about $127 million. (Woodard-USGS)
W72-06767

SPILLWAY FOR NEW CUMBERLAND LOCKS AND DAM (FINAL DESIGN), OHIO RIVER WEST VIRGINIA--HYDRAULIC MODEL INVESTIGATION,
Waterways Experiment Station, Vicksburg, Miss.
E. S. Melsheimer, and T. E. Murphy.
Available from NTIS, Springfield, Va. 22151 as AD-724 933, Price $3.00 paper copy. Technical Report No 2-585, November 1961. 17 p, 16 plate, 12 photo, 11 tab, 3 ref.

Descriptors: *Locks, *Dams, *Design data, *Model studies, Hydraulics, Ohio River, Navigation, Hydraulic structures, Gates, Settling basins, Diffusions, Hydraulic jump, Bulkheads, Gate control, Hydrologic data, West Virginia.
Identifiers: *New Cumberland Dam (W Va).

Studies were conducted in a 1:25 scale section model of the New Cumberland Locks and Dam which reproduced one gate bay and adjacent half bays, and were supplemented by observations of stilling basin performance in a 1-ft-wide glass-sided flume. The navigation structures are being constructed on the Ohio River 54 miles below Pittsburgh, Pennsylvania to replace outmoded existing structures. Tests concern hoist loads and performance tendencies of the submergible tainter gate, performance of the stilling basin below both the submergible and nonsubmergible gates, and hydraulic forces acting in a vertical direction on the emergency bulkheads. Loads on the gate hoist were found to be about as predicted and no appreciable unstable loadings were encountered. The study shows it is impracticable to modify prototype plans sufficiently to obtain good stilling action below the submergible gates for the full range of flow conditions and it is planned that undesirable basin action will be avoided by proper gate operation. (Lang-USGS)
W72-06768

EFFECT OF PIPELINE JUNCTIONS ON WATER HAMMER SURGES,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
D. J. Wood, and S. P. Chao.
Transportation Engineering Journal, American Society of Civil Engineers, Vol 97, No TE3, Paper 8296, p 441-457, August 1971. 14 fig, 3 tab, 8 ref, append.

Descriptors: *Pipelines, *Pipe flow, *Junctions, *Water hammer, *Model studies, Hydraulic systems, Waves (Water), Structural analysis, Structural design, Structural engineering.

The transmission and reflection characteristics of water hammer pressure surges at junctions of pipes were studied. The effects of pipeline orientation, concentrated friction loss and motion of the piping system at the junctions were considered. The results were compared to the presently used relationships for surge reflection and transmission at junctions which do not consider these effects. If the pipeline is completely restrained from motion the pipeline orientation and concentrated friction loss at the junction has little effect. However, if the junction is free to undergo even slight movements, the reflection and transmission characteristics of pressure waves at such junctions may be significantly affected. (Woodard-USGS)
W72-06781

LONGVIEW LAKE, LITTLE BLUE RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer, District, Kansas City, Mo.

Available from the National Technical Information Service as PB-200 795F, $3.00 in paper copy, $0.95 in microfiche. November 9, 1971. 37 p, 1 map, 2 tab.

Descriptors: *Flood protection, *Missouri, *Environmental effects, *Dam construction, Flood control, Impounded waters, Recreation demand, Levees, Water quality control, Wildlife habitats, Lakes, Land development, Rivers.

The Longview Lake project is part of a basin plan consisting of two lakes, channel works, and levee protection for flood control, water quality, recreational, and fish and wildlife enhancement purposes. Dam construction will control a 50.3 square mile drainage area and contain 930 acres of surface water. The cost-benefit ratio is 1.6. The area's topography is rolling with narrow flood plains. The river is presently a free-flowing stream. Environmental impacts include low flow augmentation, downstream flood protection, the creation of recreation areas, innundation of six miles of stream, mud flat development, and land development with subsequent wildlife reduction. The project would innundate 930 acres of land and reduce wildlife population. The Corps found no economically feasible alternatives to the project. Rapid development dictates an immediate consideration of flood control needs. The lake would accelerate the area's development, but it would also guarantee preservation of open spaces. Comments from concerned agencies are set forth. (Earl-Florida)
W72-06881

DANBURY LOCAL PROTECTION PROJECT, STILL RIVER, DANBURY, CONNECTICUT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-201 675F, $3.00 in paper copy, $0.95 in microfiche. August 11, 1971. 9 p, 1 map.

Descriptors: *Environmental effects, *Flood protection, *Connecticut, *Channeling, Channel improvement, Flood control, River training, Channel flow, Channels, Conduits, Water quality, Rivers, Land development, Wildlife habitat, Fish populations.
Identifiers: *Still River (Conn).

The project is designed to protect Danbury from flooding by the Still River. The project includes the construction of a 3,625-foot long concrete channel and a 2,695-foot long riprapped channel in the existing river. The project has a 1.01 benefit to cost ratio. The Still River affords only limited recreational opportunities, supports only sparse stocks of rough fish, and contains no endangered species of fish or wildlife. Environmental impacts include a decrease in space for biota establishment, increased use of adjoining lands, and improvement of long-term water quality goals. Biotic alteration will be an adverse effect. The only alternative would be not to implement any improvements, and only limited advantages would thereby be obtaine. The commitment of a minor amount of stream habitat will be necessary to protect a rapidly growing metropolitan area. Gains far outstrip losses. Labor and destruction of habitat by filling, dredging, and paving constitute irreversible commitments of resources. Comments of concerned agencies are set forth. (Earl-Florida)
W72-06882

ARON V. CITY OF PHILADELPHIA (INADEQUACY OF MUNICIPAL SEWER IN EXCEPTIONAL INSTANCES).
For primary bibliographic entry see Field 06E.
W72-06896

ENVIRONMENTAL DEFENSE FUND, INC. V. CORPS OF ENGINEERS (STANDING OF ENVIRONMENTAL ORGANIZATION TO CONTEST DAM CONSTRUCTION).
For primary bibliographic entry see Field 06E.
W72-06897

PRELIMINARY ANALYSIS OF THE ECOLOGICAL ASPECTS OF DEEP PORT CREATION AND SUPERSHIP OPERATION.
Institute for Water Resources (Army), Alexandria, Va.

Available from NTIS, Springfield, Va. 22151 as AD-732 465 Price $3.00 paper copy; 95 cents microfiche. IWR Report 71-10, October 1971. 31 p, 1 tab. Contract No DACW 31-71-C-0110.

Descriptors: Harbors, *Coastal structures, *Ships, *Dredging, *Environmental effects, Ecology, Planning, Reviews, Water pollution sources, Water pollution control.
Identifiers: Deep ports, Superships.

The probable ecological impacts of supership operations and deep port development are summarized. Superships have entered world commerce and interest has rapidly expanded in the possibilities of developing U.S. ports which can receive such vessels and handle their cargos with efficiency and safety. Such vessels require at least 60 feet of water, and predictions anticipate need for 80-120 feet of depth within decades. Of the 100 principal U.S. ports, only those in Puget Sound and some parts of Alaska exceed 55 feet in depth. Large ships and deep ports would, therefore, require creation of new facilities and the operation of such ships and ports will affect the environment. Basic information required for prediction of ecological impacts is outlined, and seven major research problems are identified to meet current information deficiencies. (Woodard-USGS)
W72-06923

SPILLWAY GATE VIBRATIONS ON ARKANSAS RIVER DAMS, ARKANSAS AND OKLAHOMA; HYDRAULIC MODEL INVESTIGATION,
Waterways Experiment Station, Vicksburg, Miss.
G. A. Pickering.
Technical Report H-71-5, June 1971. 11 p, 2 tab, 7 plate.

Descriptors: *Gates, *Vibrations, Dams, Hydraulic models, *Spillway gates, *Radial gates, Arkansas, Oklahoma.
Identifiers: *Arkansas River Navigation Project.

The Arkansas River navigation project has 17 individual lock and dam projects. Vibration of the tainter gates has been reported at several of these dams, the major causes of gate vibrations being the gate lip and bottom seal designs. A 1:12-scale model reproducing one 60-ft-wide gate bay and the adjacent half bays was used to investigate the gate vibrations. The central gate reproduced the prototype with respect to size, shape, and weight, whereas the adjacent gates were only schematic. Prototype water-surface elevations and flow conditions were accurately reproduced in the model. Vibrations of the prototype gates attributable to the gate lip geometry were reproduced for similar flow conditions. Revisions in the shape of the gate

lip were made, successfully eliminating the vibrations. Vibrations of prototype gates were attributable to fluttering of the rubber seal were not exactly reproduced in the model for similar flow conditions because of inability to reproduce elastic and geometric properties of the rubber seal. However, it was determined in the model that there would be no vibrations for any flow conditions with the rubber seal and backing plate removed. Removal of the seal is considered feasible for the prototype. (CE)
W72-06994

THE CHAC PLAN: IRRIGATION STRUCTURE IN AN UNDERDEVELOPED REGION OF PECULIAR ECOLOGY IN THE STATE OF YUCATAN (EL PLAN CHAC: OBRA DE RIEGO EN UNA REGION SUBDESARROLLADA Y DE ECOLOGIA PARTICULAR, EN EL ESTADO DE YUCATAN).
Secretaria de Recursos Hydraulicos, Mexico City. Direccion de Pequena Irrigacion.

Ingenieria Hidraulica en Mexico, Vol. 24, No. 2, p. 210-228, 1970. 1 map, 7 diagrams, 5 photos.

Descriptors: *Sprinkler irrigation, *Canal design, *Concrete-lined canals, *Canal linings, *Surface runoff, *Groundwater, *Social aspects, Crop production, Soil physical properties, Economic feasibility, Planning.
Identifiers: *Lithosols.

Yucatan is an underdeveloped state in Mexico devoted mainly to traditional and rudimentary agricultural activities. Its inhabitants' existence revolved around nomadic cultivation of corn. The objective of the Chac Plan is to raise the standard of living mainly through the establishment of permanent settlements and sprinkler irrigation. The lithosols with unusually high permeability, minimize surface runoff and water supply is restricted to groundwater which has a high salt content. Because of the topography and soil, permanent concrete-lined canals and portable aluminum ducts were built above the grading line. The aluminum ducts, however, underwent pitting type corrosion which led to experiments with plastic canals; this problem was solved by placing a zinc filter in the aluminum ducts. The project has been successful in ending nomadism, making the most efficient use of available water, cultivating a variety of crops and improving socio-economic conditions. (Quiroz-Arizona)
W72-07061

MARTINS FORK LAKE, CUMBERLAND RIVER BASIN, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Nashville, Tenn.

Available from the National Technical Information Service as PB-200 619-F, $3.00 in paper copy, $0.95 in microfiche. July 6, 1971. 14 p, 6 disc.

Descriptors: *Flood control, *Water resources development, *Environmental effects, *Dam construction, Project purposes, Federal project policy, Project benefits, Recreation, Water quality control, Community development, Area redevelopment, Damsites, Administrative agencies, State governments, Federal government, Flood damage, Flood protection, Channel improvement, Project planning, Kentucky.
Identifiers: *Martins Fork Lake Project (Ky), National Environmental Protection Act, *Environmental impact statements.

The purposes of the Martins Fork Lake Project, involving construction of a concrete dam about 106 feet in height and 465 feet in length, are flood control, water quality control, and recreation. Adverse environmental effects include a loss of game habitat due to permanent inundation, loss of several miles of natural stream to the pool of water, and relocation of a small number of families. Alternatives to the project include levees and flood walls, channel improvement, other lakes, and non-structural alternatives such as floodproofing. None of the alternatives would provide as much protection without inducing worse environmental effects. There is little agricultural use of the project area, and its scenic qualities are common. Area redevelopment resulting from the project would benefit the economy of the vicinity, where unemployment and underemployment are serious problems. Multiple-level outlets on the dam and flow regulation would improve downstream water quality and enhance the tailwater fishery. Comments of other state and federal agencies are included. (Brackins-Florida)
W72-07180

8B. Hydraulics

TESTS TO PROVE PERFORMANCE OF HIGH TEMPERATURE WATER JET COMPRESSOR,
American Hydrotherm Corp., Long Island City, N.Y.
For primary bibliographic entry see Field 03A.
W72-06593

BALANCED STORM DRAINAGE, (STORM DRAINS FOR ROADWAYS),
Kansas Water Resources Research Inst., Manhattan.
J. S. McNown, and C.-H. Tai.
Available from the National Technical Information Service as PB-208 024, $3.00 in paper copy, $0.95 in microfiche. Project Completion Report Contribution No. 94, February 1972. 37 p, 8 fig, 3 ref. OWRR A-036-KAN (1).

Descriptors: *Interception, Depression, *Storm drains, *Roads, *Kansas, *Model studies, *Storm runoff, Surface runoff, *Open channel flow, Slopes, *Intakes.
Identifiers: *Flow distribution, Flow interception, *Indentation, Grate inlet, Curb opening.

Model tests based on the system in use by the Kansas State Highway Commission were conducted at a scale of 1:3 to provide additional information on the flow of storm water in street gutters and its interception by storm drains. The significant factors studied were the effectiveness of flow in channel and the effectiveness of grate inlets and curb openings. For most roadways and gutters, a grate inlet will intercept all of the flow which would pass over it and some 20% to 100% more, depending on the slope. A curb opening in combination with a grate inlet adds very little to the interception. Incterception by a combined inlet is almost independent of the longitudinal gutter slope. In contrast, a curb opening alone is much less effective on steep roadways. An indentation added to a curb inlet of standard design without grate inlet beginning a short distance upstream allows more flow to reach the curb opening because it initiates lateral flow sooner. Although the increase is significant, 50% to 100% of the intercepted flow, the total interception varies from a third to two-thirds of that intercepted by a combined inlet. Additional tests are needed to show how best to increase the interception. The optimum relationship between length of opening and spacing should be determined as a function of slope and discharge, and of inlet type.
W72-06604

FORCES ON A SUBMERGED BREAKWATER,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
T. M. Dick.
In: Hydraulic research and its impact on the environment; Proceedings, 14th Congress of the International Association for Hydraulic Research, Paris, France, 29 Aug. - 3 Sept. 1971, vol. 2, p 101-108. 8 fig.

Descriptors: *Breakwaters, *Waves (Water), *Hydraulic models, Model studies, Hydraulic design, Hydraulic structures.

The horizontal and vertical forces caused by waves passing over a submerged breakwater were measured in a series of model tests. A simplified theory was employed to calculate forces and overturning moments. Theoretical forces and overturning moments were compared. A linear relationship was found for the horizontal forces and the overturning moment and the calculated were always greater than the measured forces. Measured vertical forces were not a linear function of the calculated forces; in addition the measured forces were greater. The experiments provide an empirical method for computing forces on rectangular submerged structures. Measured values of the reflection coefficient are also given as it is a necessary quantity to undertake the simple calculation. (C-CIW)
W72-06691

CAVITATION IN HORIZONTAL PIPELINES DUE TO WATER HAMMER,
Technische Hogeschool, Delft (Netherlands).
J. P. Th Kalkwijk, and C. Kranenburg.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 97, No 10, p 1585-1605, Oct 1971. 10 fig, 7 ref, 2 append.

Descriptors: *Water hammer, *Cavitation, *Pipelines, Fluid mechanics, Negative pressure, Hydraulic models, Model tests, Test results, Uniform flow, Celerity.
Identifiers: Pressure profiles, Netherlands.

Sudden pump failures may cause low pressures in pipelines and create a negative pressure wave traveling downstream, At some point in the pipeline, vapor pressure may be reached, and cavitation may occur. Two approaches to this phenomenon are described. The first, based on the behavior of nuclei or gas bubbles, fails where the growth of the bubbles becomes unstable. Based on the conclusions of the first approach, a schematization is chosen in which the celerity at vapor pressure is reduced to zero; for higher pressures, the normal water hammer celerity is assumed. Calculations are given for a model pipeline with uniform flow suddenly stopped. The theory describes the general behavior of the process in the model; however, the observed wave dispersion cannot be predicted. (USBR)
W72-06735

STUDIES TO DETERMINE THE FEASIBILITY OF A BAFFLED APRON DROP AS A SPILLWAY ENERGY DISSIPATOR--CONCONULLY DAM SPILLWAY--OKANOGAN PROJECT, WASHINGTON,
Bureau of Reclamation, Denver, Colo.
T. J. Rhone.
Bureau of Reclamation Report REC-ERC-71-29, June 1971. 5 p, 4 fig, 3 tab, 1 ref.

Descriptors: Model tests, *Hydraulic models, Energy, Dissipation, Dams, Hydraulics, *Spillways, Hydraulic design, Baffle piers, Channel erosion, Washington, Stilling basins, Discharge (Water), Safety factors.
Identifiers: Conconully Dam (Wash), Okanogan Project (Wash), Spillway design flood.

The existing spillway structure at Conconully Dam, Washington, was determined to be structurally unsafe and incapable of discharging the design flood. Installation of a conventional hydraulic jump stilling basin or flip bucket to handle the design flood was impractical because of poor foundation conditions. However, preliminary investigations showed that if the allowable unit discharge of a baffled apron drop could be increased from 60 cfs/ft of width to about 80 cfs, such a structure could be built on sound rock. Hydraulic model studies were performed to confirm a design for a baffled apron drop based on a

unit discharge of 77.7 cfs/ft of width. The tests showed that the higher capacity structure was an effective and safe energy dissipator, and could handle unit discharges up to twice the design discharge. The effect of baffle pier location on the reservoir elevation for maximum discharge was determined. An optimum configuration for the channel bed downstream of the concrete apron was developed to prevent erosion of the apron. (USBR)
W72-06741

ULTRASONIC METHOD OF FLOW MEASUREMENT IN LARGE CONDUITS AND OPEN CHANNELS,
Central Research Inst. of Electric Power Industry, Tokyo (Japan); and Tokyo Keiki Co. ltd. (Japan).
For primary bibliographic entry see Field 07B.
W72-06748

ULTRASONICS AS A STANDARD FOR VOLUMETRIC FLOW MEASUREMENT,
Westinghouse Electric Corp., Annapolis, Md.
For primary bibliographic entry see Field 07B.
W72-06753

MODERN DEVELOPMENT AND NEW APPLICATIONS OF MAGNETIC FLOWMETERS,
Krohne (Ludwig) KG, Duisburg (West Germany).
For primary bibliographic entry see Field 07B.
W72-06754

SUSPENDED LOAD,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 02J.
W72-06762

SPILLWAY FOR NEW CUMBERLAND LOCKS AND DAM (FINAL DESIGN), OHIO RIVER WEST VIRGINIA--HYDRAULIC MODEL INVESTIGATION,
Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08A.
W72-06768

EFFECT OF PIPELINE JUNCTIONS ON WATER HAMMER SURGES,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08A.
W72-06781

HULBURT CREEK HYDROLOGY, SOUTHWESTERN WISCONSIN,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 02E.
W72-06789

MECHANICS OF SEDIMENT SUSPENSION DUE TO OSCILLATORY WATER WAVES,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 02J.
W72-06812

BOUNDARY-LAYER FLOW STRUCTURE: EFFECTS ON DETACHMENT OF NONCOHESIVE PARTICLES,
Agricultural Research Service, Manhattan, Kans. Div. of Soil Erosion.
For primary bibliographic entry see Field 02J.
W72-06814

THE SPEEDS OF SAND GRAINS IN LAMINAR FLOW OVER A SMOOTH BED,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 02J.
W72-06815

DRAINAGE WITH PERFORATED PLASTIC TUBING,
Forest Hydrology Lab., Wenatchee, Wash.
For primary bibliographic entry see Field 04A.
W72-06834

STABLE BED PROFILES IN CONTINUOUS BENDS,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W72-06916

A TECHNIQUE FOR SMOOTHING RIVER FLOWS DURING HYDROELECTRIC POWER PRODUCTION,
Auckland Univ., (New Zealand). Dept. of Theoretical and Applied Mechanics.
For primary bibliographic entry see Field 04A.
W72-06982

CONTROL OF SCOUR AT HYDRAULIC STRUCTURES,
Waterways Experiment Station, Vicksburg, Miss.
T. E. Murphy.
Miscellaneous Paper H-71-5, March 1971. 6 p, 7 photo, 4 plate.

Descriptors: *Scour, *Hydraulic structures, *Riprap, *Energy dissipation, *Channel erosion.
Identifiers: *Scour hole, *Secondary dissipation.

A case is made for providing for or preforming a scour hole in which flow from a hydraulic structure can expand and dissipate its excess energy in turbulence rather than in a direct attack on the channel boundaries. Examples are given which demonstrate that riprap schemes providing for flow expansions make it feasible to stabilize the channels with rock of an economical size and provide factors of safety against riprap failure and costly maintenance. (CE)
W72-06991

SPILLWAY FOR CLARENCE CANNON RESERVOIR, SALT RIVER, MISSOURI; HYDRAULIC MODEL INVESTIGATION,
Waterways Experiment Station, Vicksburg, Miss.
B. P. Fletcher.
Technical Report H-71-7, October 1971. 28 p, 2 tab, 18 photo, 30 plate.

Descriptors: *Spillways, *Hydraulic models, Open channel flow, Stilling basins, Model studies, *Energy dissipation, Missouri.
Identifiers: *Clarence Cannon Dam, *Salt River (Mo).

The spillway for Clarence Cannon Dam was studied on a 1:50-scale comprehensive model to determine flow conditions in the approach and exit channels and performance of various elements of the structure. Withdrawal characteristics of the original design water-quality weir were unsatisfactory and subsequent modifications were developed to obtain the desired withdrawal characteristics without affecting the capacity of the spillway. Simulated pumpback operations indicated that the proposed pumped storage scheme of power generation will not produce any material internal mixing or destratification of the reservoir. The right and left abutments were modified to reduce drawdown and improve distribution of flow entering the stilling basin. The baffle piers were relocated to improve energy dissipation in the stilling basin. Stilling basin training wall heights were reduced downstream of the baffle piers without impairing hydraulic jump action or exit channel velocity distribution. Dynamic shear and moment on each of the six monoliths of the divider wall between the stilling basin and powerhouse tailrace were measured by means of electronic force cells. Size and extent of exit channel protection required downstream of the spillway were also determined. (CE)
W72-06993

PREDICTING CONSTRUCTION EFFECTS BY TIDAL MODELING,
Waterways Experiment Station, Vicksburg, Miss.
H. B. Simmons, J. Harrison, and C. J. Huval.
Miscellaneous Paper H-71-6, April 1971. 37 p, 17 fig, 3 tab, 7 ref.

Descriptors: *Hydraulic models, *Mathematical models, Construction, Surges, *Test procedures, Dikes, Salinity intrusion.
Identifiers: *Tidal models, Chesapeake and Delaware Canal, Delaware Estuary, San Diego Bay.

Tidal modeling is divided into two areas: physical scale modeling and mathematical modeling. Physical modeling entails developing, constructing, verifying, and testing a scale model of a prototype. Mathematical modeling entails the same steps for a set of mathematical and/or logical expressions whose solution, usually on a digital computer, yields the desired parameters. The modeling technique and solution method for a specific problem are determined by the problem itself, the type and precision of desired results, and available personnel and physical resources. Three specific applications of physical models are discussed: a study of the feasibility of renovating and maintaining three dikes in Delaware Estuary, a study of flushing characteristics of San Diego Bay with various second entrance plans, and a study of salinity intrusion in Delaware Estuary. Mathematical models are discussed, with emphasis on mathematical models for predicting one- and two-dimensional tidal flows. Specific examples are the Chesapeake and Delaware Canal and a general surge study. Physical and mathematical modeling techniques each have certain advantages. Extensive employment of both techniques shows conclusively that complementary use to resolve different aspects of a comprehensive tidal problem usually provides optimum results. (CE)
W72-06996

FRICTION FACTORS IN SOLID MATERIAL LADEN SYSTEMS,
Middle East Technical Univ. Ankara (Turkey) Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W72-07010

SUPERCRITICAL FLOW OVER SILLS,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
J. A. McCorquodale, and M. K. Giratalla.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 98, No HY4, Paper 8846, p 667-679, April 1972. 9 fig, 23 ref, append.

Descriptors: *Weirs, *Supercritical flow, *Jets, *Energy dissipation, Hydraulics, Numerical analysis, Spillway crests, Discharge (Water), Turbulent flow, Hydraulic jump, Settling basins.
Identifiers: Conformal mapping.

A conformed mapping solution for irrotational gravity-free flow was modified to determine the drag on continuous and dentated sills in stilling basins. The effect of gravity is partially accounted for by the inclusion of the upstream hydrostatic force in the momentum equations. For the dentated sill continuity, energy and momentum relationships were used to divide the total flow into two portions (one passing between the baffles and another passing over the baffles). Two-dimensional techniques were then applied to determine the baffle drag coefficient. Good agreement was found between experimental and theoretical drag coefficients for both the continuous and dentated sills for (jet height)/ (baffle height)= 1.4. (Knapp-USGS)
W72-07018

TIDAL FLUSHING SYSTEM,
For primary bibliographic entry see Field 05G.
W72-07092

CONTROL VALVE SIZING FORMULAS,
Crawford and Russell, Inc., Stamford, Conn.
For primary bibliographic entry see Field 08C.
W72-07137

THE DISPERSION OF MATTER IN TURBULENT PIPE FLOWS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 05B.
W72-07138

8C. Hydraulic Machinery

THERMOELECTRIC GENERATORS POWERED BY THERMAL WASTE FROM ELECTRIC POWER PLANTS,
Pacific Northwest Water Lab., Corvallis, Oreg.
Mostafa A. Shirazi.
Copy available from GPO Sup Doc, $0.45; microfiche from NTIS as PB-207 870, $0.95. Water Pollution Control Research Series 16130, October 1970, 27 p, 5 fig, 5 tab, 6 ref. EPA-WQO Program 16130---10/70.

Descriptors: *Thermodynamics, *Heat transfer, *Heated water, *Water pollution sources, Waste water (Pollution), Heat exchangers, *Thermal pollution.
Identifiers: *Thermoelectric condenser, *Waste heat, *Thermoelectric couples.

The feasibility of recovering electricity from the waste heat of electric power plants was assessed. Sources considered were: stack flue gas, gas-turbine exhaust, and condensing steam. Typical 1600 MW fossil-fuel steam plants and gas-turbine plants were used as examples. Flat plate heat exchangers were designed with thermoelectric couples arranged in series within the plates. Heat flux, conversion efficiencies, and flow friction losses were calculated. Except for the condenser application, the friction losses are several times the thermoelectric power generated. Under favorable conditions, 3 to 9 MW is obtainable from the thermoelectric condensers. The high material cost, however, precludes all such applications today.
W72-06586

EQUIPMENT COMPONENTS FOR LARGE EVAPORATOR PLANTS: A SUMMARY REPORT,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 03A.
W72-06592

DEAERATOR EJECTORS AND BLOWERS FOR 50-MGD AND LARGER DESALINATION PLANTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 03A.
W72-06594

WEED PUMP,
For primary bibliographic entry see Field 04A.
W72-06631

SUBMERSIBLE OPERATIONS IN GEORGIAN BAY AND LAKE ERIE - 1970,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
Peter G. Sly.
Canada Department of Energy, Mines and Resources. Inland Waters Branch. Technical Bulletin No. 44, 1971. Ottawa. 36 p, 5 fig, 11 ref.

Descriptors: *Submarines, *Benthos, *Lake Erie, Equipment, Underwater, Design.
Identifiers: *Georgian Bay, *Pisces III.

Trials of the submersible Pisces III were held to assess the suitability of submersibles in various research projects. Equipment failures, poor weather and inexperience prevented the completion of all tasks. Pisces III is more suited to deep water than shallow water operations. Other aspects of its performance are discussed. For shallow water projects, divers usually are preferred to submersibles; however the latter will be useful for short periods in deep-water studies. Contracting this type of vessel is suggested, whereas design specifications are outlined for a shallow water submersible. (Fosdick-CCIW)
W72-06681

THYRISTOR VOLTAGE REGULATOR REPLACEMENT FOR RHEOSTATIC REGULATORS, PILOT APPLICATION - GRAND COULEE POWERPLANT,
Bureau of Reclamation, Denver, Colo.
F. R. Schleif.
Bureau of Reclamation Report REC-ERC-71-28, June 1971, 47 p, 34 fig, 3 tab, 3 ref.

Descriptors: *Rectifiers, *Voltage regulations, Direct current, Electric generators, Electric analogs, Sensors, Electronics.
Identifiers: *Excitation, *Transducers, Grand Coulee Powerplant (Wash), Columbia Basin Project (Wash), Solid state devices, Thyristors, Electrical faults, Power system stability, Interconnected systems.

Rheostatic voltage regulators have satisfactorily served the hydroelectric generators at Grand Coulee Powerplant for over 2 decades. However, the development of extensive power system interconnections requires more accurate, convenient, and faster voltage control. As part of an automation and modernization program, the rheostatic regulators were replaced with thyristors. Thyristor circuits incorporating duty cycle modulation and capacitor commutation techniques were applied in a generator voltage regulator system having a direct-current power source. Rheostatic regulators were replaced by these more conveniently controlled continuous-acting regulators; existing d-c pilot exciters were retained. Descriptions of design considerations and circuit operation and maintenance procedures are given for the thyristor voltage regulator and supplementary excitation control circuitry. Innovations include commutation failure detection and correction, and voltage killer (regulation-to-zero) for internal machine faults. Two research models were installed at Grand Coulee Powerplant for evaluation. (USBR)
W72-06758

HOWELL-BUNGER VALVE VIBRATION SUMMERSVILLE DAM PROTOTYPE TESTS,
Waterways Experiment Station, Vicksburg, Miss.
F. M. Neilson.
Available from NTIS, Springfield, Va. 22151 as AD-731 491 Price - $3.00 paper copy; 95 cents microfiche. Technical Report H-71-6, September 1971. 61 p, 18 fig, 13 plate, 4 tab, 26 ref.

Descriptors: *Valves, *Hydraulic valves, *Prototype tests, *Flow control, *Reservoirs, Dams, Outlet works, Hydraulic structures, Hydraulic design, Analytical techniques, Instrumentation, Evaluation, Structural analysis.
Identifiers: Valve vibration tests.

Data are presented for tests concerned with the vibration of a 106-3/4-in. Howell-Bunger valve at Summersville Dam, Gauley River, W. Va. Prototype measurements included both dynamic and time-averaged values of pressures in the flow and strain at locations on the valve structure. Transverse, vertical, and peripheral accelerations were measured at the downstream end of the valve cone. The data were recorded simultaneously on analog magnetic tape and on oscillograph charts. Data reduction was by scaling the oscillograph traces and by using electronic analog equipment to perform linear spectral density, amplitude density, and cross-correlation analyses on the magnetic tape data. The results include information on discharge characteristics of the Summersville outlet works, evaluation of the nature of the pressure fluctuations in the flow, and evaluation of the nature of the vibration of the valve at the strain gage and accelerometer locations. The primary conclusion regarding the vibration is that the significant strain fluctuations are caused by low-frequency pressure fluctuations buffeting the valve. These frequencies are well below the natural frequencies of the structure. (Woodard-USGS)
W72-06922

SYSTEMS STUDY OF OIL SPILL CLEANUP PROCEDURES. VOLUME I: ANALYSIS OF OIL SPILLS AND CONTROL MATERIALS,
Dillingham Corp., La Jolla, Calif. Applied Oceanography Div.
For primary bibliographic entry see Field 05G.
W72-07133

CONTROL VALVE SIZING FORMULAS,
Crawford and Russell, Inc., Stamford, Conn.
A. Brodgesell.
Instrumentation Technology, Vol. 19, No. 1, p 60-64, January 1972. 5 fig, 7 ref.

Descriptors: *Valves, *Flow control, *Equations, Cavitation, Pipes, Laminar flow, Mathematical studies.
Identifiers: Control valve sizing, Capacity, Calculations, Liquid flow, Pipe reducers, Choked flow.

Prediction of required control valve size for specific installations can be done accurately using standard equations. These equations, and certain modifications to extend their usefulness, are presented and reviewed. Consideration is given to cavitation and choked flow, laminar flow, and the effects of pipe reducers. (Mortland-Battelle)
W72-07137

AN ANALYSIS OF VANE-IN-ROTOR PUMP,
Newcastle Univ. (Australia). Dept. of Mechanical Engineering.
K. D. S. R. Somayajulu.
ASME Journal of Basic Engineering, Vol. 93, No. 4, p 505-517, December 1971. 25 fig, 3 ref.

Descriptors: Pumps, Theoretical analysis, Evaluation, Equipment, Mechanical equipment, Instrumentation.
Identifiers: Vanes-in-rotor pump.

Vanes-in-rotor pumps, which can be used for pumping liquids, consist of sliding vanes in a rotor rotating eccentrically with regard to a stator. These pumps have been analyzed theoretically. The analysis considers rotor-to-stator radius ratios, the number of vanes, indices of compression, and inlet and outlet port openings. Graphs are given for the variation of torque, frictional torque, output, mass flow, and efficiency. From this analysis, characteristics charts can be drawn, which will simplify the design and choice of the best pump. (Mortland-Battelle)
W72-07147

8D. Soil Mechanics

SEVERAL PROBLEMS IN NONUNIFORM SEEPAGE IN THE SLOPES OF STRUCTURES WITH VARIABLE BOUNDARY CONDITIONS,
For primary bibliographic entry see Field 02G.
W72-06740

CONSOLIDATION AT CONSTANT RATE OF STRAIN,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 07B.
W72-06743

NONLINEAR ANALYSES USING SPLINE FUNCTIONS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. S. Desai.
Journal of the Soil Mechanics and Foundation Division, American Society of Civil Engineers, Vol. 97, No SM10, p. 1461-1480, October 1971. 13 fig, 4 tab, 19 ref, 2 append.

Descriptors: *Soil properties, *Finite element method, *Mathematical analysis, *Soil mechanics, Geology, Model studies, Loads (Forces), Footings, Computer models, Foundations.
Identifiers: *Spline functions, *Nonlinear properties, Hyperbolic functions, Soil modulus, Stress-strain curves, Computer applications.

To predict the load-displacement behavior of structures on soil, an adequate representation of the soil properties is necessary. Cubic spline functions are able to satisfactorily represent soil stress-strain properties. These functions can be used in the finite element method to make load-displacement analyses. A steel model footing 3 in. in diameter was placed on a cohesive soil and loaded vertically. The footing movements under load were determined and compared with finite element analyses using both spline and hyperbolic functions. Both methods gave good results at ultimate movement, but at smaller movements the method using spline functions was considerably more accurate. The effects of the magnitude of the initial tangent stiffness on the load-deformation behavior are stated. (USBR)
W72-06744

SEISMIC DESIGN OF SOIL-STRUCTURE INTERACTION SYSTEMS,
Northwestern Univ., Evanston, Ill.
R. A. Parmelee, and J. H. Wronkiewicz.
Journal of the Structural Division, American Society of Civil Engineers, Vol 97, No ST10, p 2503-2517, Oct 1971. 9 fig, 1 tab, 25 ref, 2 append.

Descriptors: *Seismic design, *Soil-structure, *Buildings, *Structural analysis, Dynamic response, Foundations, Bibliographies, Flexible foundations, Seismic studies, Structures, Earthquake engineering, Seismic stability, Foundation modulus, Dynamic stability, Structural behavior, Structural stability, Soil dynamics.
Identifiers: *Design earthquake.

A method of evaluating the maximum flexural response of a soil-structure system when subjected to seismic excitation is presented. The flexible foundation medium is assumed to be represented by a homogeneous, isotropic, elastic half space whose dynamic properties can be characterized by stiffness and associated damping constants. The coefficients obtained are valid only when Poisson's ratio is equal to zero. The structure is an elastic single-story building situated on the surface of the foundation medium. Investigation of the response of numerous soil-structure systems leads to a set of design curves. The maximum flexural response of the soil-structure system can easily be determined using these curves in conjunction with appropriate seismic response spectra. The maximum flexural response of the structure may be increased or decreased compared to that of the same structure on a rigid foundation. (USBR)
W72-06745

POLYURETHANE FOAMED PLASTICS IN SOIL GROUTING,
Kaiser Engineers, Oakland, Calif.; and California Univ., Berkeley.
T. S. Vinson, and J. K. Mitchell.
Paper, American Society of Civil Engineers Annual National Environmental Engineering Meeting, St. Louis, Missouri, Oct 1971. 29 p, 4 fig, 3 tab, 1 ref, 2 append.

Descriptors: *Grouting, *Soil stabilization, Soil mechanics, Sands, Permeability, Compressive strength, Chemistry, Electron microscopy, Viscosity, Curing, Stabilization, Density, Foam, Soil strength, Soil tests, Soil treatment, Plastics.
Identifiers: *Grout mixes, *Plastic foam, Lunar soils, Lunar materials, *Polyurethane resins.

In the search for a lightweight grout for lunar soils, one polyurethane foam investigated showed the best potential. Six polyurethane foams tested met the following criteria: (1) uniform cell size, (2) little, if any, residual unfoamed plastic, (3) strong, but not friable, (4) injection time of about one minute, (5) swift and complete reaction, (6) a one-shot process, and (7) a viscosity similar to water. The 6 foams were injected into small sand samples of both dry and saturated soil. Some of the samples were then cured in dry conditions; others were submerged. From these tests, only one foam closely satisfied the following criteria: (1) reasonable strength and low permeability, (2) small strength decrease after submergence, (3) permeability decrease or constancy after submergence, and (4) duplicable properties. This foam was then injected into sand samples contained in 50 gal barrels. The initially dry sand samples after dry and wet curing had compressive strengths of about 6000 and 2600 psi, respectively. The initially saturated and wet cured samples had compressive strengths of about 1100 psi. The chemistry of polyurethanes is described. (USBR)
W72-06751

RIVER BED DEGRADATION AFTER CLOSURE OF DAMS,
Alexandria Univ. (Egypt). Faculty of Engineering.
For primary bibliographic entry see Field 02J.
W72-07020

KLUTINA RIVER FLOOD CONTROL, COPPER CENTER, ALASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.

Available from the National Technical Information Service as PB-200 544-F, $3.00 in paper copy, $0.95 in microfiche. June 1971. 24 p, 1 map, 9 disc.

Descriptors: *Alaska, *Levees, *Flood protection, *Glaciation, *Environmental effects, Fish passages, Flood plains, Fish migration, Vegetation effects, Human population, Scenery, Water balance, River flow, River beds, Flood control, Salmon, Non-structural alternatives.
Identifiers: Klutina River (Alas), *Environmental impact statements.

An earthfill levee project located on the Klutina River at Copper Center, Alaska, is recommended in order to protect against annual floods resulting from winter glaciation. The following consequences are designated as unavoidable adverse environmental effects: (1) visual impact, (2) access road construction, (3) borrow pit and levee vegetation clearing, (4) an increased population concentration from construction workers, and (5) destruction of salmon resting habitats. Non-structural alternatives, including flood plain management and relocation of the community, are considered impractical. The structural alternative of channel improvement is designated as more environmentally destructive and economically unjustified. To reduce environmental degradation the following actions have been incorporated into construction plans: (1) dog-legging access roads to reduce visual impact, (2) seeding portions of the levee, and (3) installation of drainage culverts to enhance salmon migration. The comments of all interested federal, state, and local entities are included. (Blank-Florida)
W72-07178

8E. Rock Mechanics and Geology

THE KOYNA EARTHQUAKE OF DECEMBER 11, 1967, AND THE PERFORMANCE OF KOYNA DAM,
California Univ., Berkeley. Earthquake Engineering Research Center.
For primary bibliographic entry see Field 08F.
W72-06794

8F. Concrete

EVALUATION OF CONCRETE AND RELATED MATERIALS FOR DESALINATION PLANTS,
Bureau of Reclamation, Denver, Colo.
Carlos G. Bates.
Office of Saline Water, Research and Development Progress Report No 345, May 1968. 38 p, 21 fig, 2 tab. 14-01-0001-544.

Descriptors: *Desalination plants, *Concrete construction, Concrete, Linings, Coatings, Protective coatings, Sealants, Corrosion control, *Desalination apparatus, Reinforced concrete, Reinforcing steel.
Identifiers: *Materials evaluation.

A test program summary report on (1) the evaluation of concrete under a variety of temperature, pressure and brine concentration conditions, (2) concrete panel and model structural studies, (3) selection and evaluation of protective coatings, sealants and polymeric products, (4) concrete reinforcement materials, and (5) compressive strengths, moduli of elasticity, Poissons ratio, temperature distribution through walls in heating and cooling cycles, creep deformation, depth of surface alteration, corrosion of reinforcing bars and evaluation of coatings and polymers. (OSW)
W72-06595

PREPARATION, PROPERTIES AND CORROSION RESISTANCE OF COMPOSITES OF CEMENT MORTAR AND ORGANIC POLYMERS,
Lehigh Univ., Bethlehem, Pa.
J. Gebauer, and R. W. Coughlin.
Cement and Concrete Research, Vol 1, No 2, p 187-210, Mar 1971. 7 fig, 7 tab, 6 ref.

Descriptors: *Concrete technology, *Corrosion, Compressive strength, Properties, Electron microscopy, Polymers, Composite materials.
Identifiers: *Concrete-polymer materials, Corrosion inhibitors, Water absorption tests, Methyl methacrylate, Hydrochloric acid, Sea water corrosion, Corrosion resistance, Styrene resins, Monomers.

Impregnation and polymerization of hardened concrete specimens with methylmethacrylate (MMA) increased the compressive strength from about 8,000 to 23,000 psi. Using styrene (PS) monomers instead of MMA, strength increased to about 20,000 psi. When the 2 monomers are added to fresh mortar and later polymerized, the compressive strengths for PMMA specimens fell to about 4,500 psi; PS specimens increased to about 10,500 psi. Samples were tested in hot sea water brine and deionized water to determine the suitability of polymer-concrete materials in desalting plants. In both liquids, polymer-concrete specimens showed better corrosion resistance than ordinary concrete specimens. No significant differences were apparent between thermal-catalytically polymerized and radiation polymerized samples. Microscopical examination revealed the structure of the polymer-cement composites. (USBR)
W72-06750

THE KOYNA EARTHQUAKE OF DECEMBER 11, 1967, AND THE PERFORMANCE OF KOYNA DAM,
California Univ., Berkeley. Earthquake Engineering Research Center.
A. K. Chopra, and P. Chakrabarti.
Available from NTIS, Springfield, Va. 22151 as AD-731 496, Price $3.00 paper copy, $0.95 microfiche. Report No EERC 71-1, April 1971. 54 p, 50 fig, 41 ref. Contract No DACW 73-69-C-0041 USAE.

Descriptors: *Gravity dams, *Earthquakes, *Earthquake engineering, *Concrete dams, *Design standards, Surveys, Dam design, Cracking, Seismology, Seismic design, Evaluation, Hydraulic engineering.
Identifiers: *Koyna Dam (India).

An earthquake of Richter magnitude 6.5 occurred in the southwestern region of India on December 11, 1967. The 2800 ft long and 338 ft high Koyna Dam, a concrete gravity dam, was in the epicentral region of this earthquake. A study was made of the damage to Koyna Dam caused by the earthquake to determine the deficiencies that may exist in current design concepts for gravity dams. Also included is a brief description of the geology and the seismic history of the area, a discussion of the relationship between the filling of the reservoir at Koyna Dam and the increase in seismic activity of the region, the properties of the Koyna ground motion and how they compare with those of California earthquakes, and a description of the damage caused to various structures of the Koyna project, buildings, and bridges. Dynamic analyses of stresses in concrete gravity dams during earthquakes demonstrate that the more critical tensile stresses occur in the upper parts of dams. (Woodard-USGS)
W72-06794

8G. Materials

MATERIALS EVALUATION PROGRAM,
Rice (Cyrus Wm.) and Co., Pittsburgh, Pa.
William E. Bell, and Henry C. Bramer.
Office of Saline Water, Research and Development Progress Report No 308, Nov. 1967. 74 p, 13 fig, 7 tab, 6 ref. 14-01-0001-1148.

Descriptors: *Corrosion, *Desalination apparatus, *Desalination plants, *Materials testing, *Heat exchangers.
Identifiers: *Materials evaluation.

This report is a continuation of R and D Program Report No. 244, Corrosion Test Program, concerning the performance of materials of construction used in salt and brackish water conversion plants. Techniques and procedures for materials evaluation are described. Side stream test loops were designed. A field evaluation report form was developed to record the data in a manner compatible with other information systems. The Material Evaluation Report Form (MERF) evolved and a system manual for the Information Handling and Retrieval System (IHRS) and the MERF is in preparation. (OSW)
W72-06587

DEVELOPMENT OF CORROSION PROBES FOR SALINE WATER APPLICATIONS,
Batelle Memorial Inst., Richland, Wash. Pacific Northwest Lab.
For primary bibliographic entry see Field 03A.
W72-06590

SCALE CONTROL WITH GRAPHITE HEAT-TRANSFER TUBES OF CONTROLLED PERMEABILITY TO STEAM,
Union Carbide Corp., Parma, Ohio.
For primary bibliographic entry see Field 03A.
W72-06591

POLYURETHANE FOAMED PLASTICS IN SOIL GROUTING,
Kaiser Engineers, Oakland, Calif.; and California Univ., Berkeley.
For primary bibliographic entry see Field 08D.
W72-06751

8H. Rapid Excavation

GEOHYDROLOGY OF PROJECT GNOME SITE, EDDY COUNTY, NEW MEXICO,
Geological Survey, Washington, D.C.
J. B. Cooper, and V. M. Glanzman.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Geological Survey Professional Paper 712-A, 1971. 24 p, 12 fig, 1 plate, 5 tab, 58 ref. Prepared in cooperation with the Atomic Energy Commission.

Descriptors: *Nuclear explosions, *Underground, *Observation wells, *Water level fluctuations, *New Mexico, Groundwater, Aquifers, Hydrogeology, Water wells, Surveys, Aquifer characteristics, Geology, Testing, Data collections.
Identifiers: Underground explosions.

On December 10, 1961, a nuclear device was detonated 1,200 feet underground in the massive salt of the Salado Formation in southwestern Eddy County, N. Mex. The water regimen of about 1,200 square miles, mostly east of the Pecos River and within 15 miles of the project site, was investigated before, at the time of, and after the explosion. Water levels in four observation wells at the site were being recorded at the time of the nuclear explosion. The estimated maximum rise of water level immediately following the explosion was about 4 ft at a distance of 2,000 ft from ground zero. About 3,200 ft from ground zero, the water level rose about 2.2 ft, then gradually returned to normal level within a period of about 11 hours. Water in the four test holes returned to preexplosion levels 2 days after the explosion. Continued observations of water level in those holes and three additional observation wells indicated no anomalous water-level fluctuations after the nuclear explosion, suggesting that the aquifer probably was not significantly ruptured by the explosion. (Woodard-USGS)
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9C. Research Facilities

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For primary bibliographic entry see Field 06E.
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BIBLIOGRAPHY OF SOVIET PUBLICATIONS ON FRESHWATER HYDROBIOLOGY AND RELATED QUESTIONS IN 1969.
For primary bibliographic entry see Field 05C.
W72-06808

A BIBLIOGRAPHY OF SOVIET PUBLICATIONS ON FRESHWATER HYDROBIOLOGY AND RELATED QUESTIONS IN 1969 (PART 2).
For primary bibliographic entry see Field 05C.
W72-06809

10C. Secondary Publication AND Distribution

BIBLIOGRAPHY OF U.S. GEOLOGICAL SURVEY WATER-RESOURCES REPORTS FOR UTAH.
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 02E.
W72-07026

10E. Translations

SOVIET WORK AND WRITING IN CLIMATOLOGY,
Wisconsin Univ., Milwaukee. Dept. of Geography.
For primary bibliographic entry see Field 02B.
W72-07033

10F. Preparation of Reviews

SALT CRYSTALLIZATION AND ROCK WEATHERING: A REVIEW,
Royal Coll. of Art, London (England).
For primary bibliographic entry see Field 02K.
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W72-07213	6E
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W72-07245	2A
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A. Centers of Competence		
University of Wisconsin, Water Resources Economics	W72-06581 06583 -- 06585 07110 -- 07112 07115 07118 -- 07119	10
University of Florida, Eastern U. S. Water Law	W72-06632 -- 06675 06836 06869 06871 -- 06887 06889 -- 06906 07177 -- 07217	122
Colorado State University, Irrigation Return Flow Quality	W72-06598 06676 -- 06678 06825 06831 -- 06835	9
U. S. Geological Survey, Hydrology	W72-06693 -- 06700 06759 -- 06787 06789 -- 06815 06907 -- 06935 06998 -- 07030 07223 -- 07245	149
University of Washington, Water Quality Requirements for Aquatic Organisms	W72-07218 -- 07222	5
University of Arizona, Arid Land Water Resources	W72-06701 -- 06706 06708, 06710 06712 -- 06715 06717 -- 06721 06723 -- 06733 07032 -- 07034 07036 -- 07037 07039 -- 07047 07049 -- 07066	60
Bureau of Reclamation, Engineering Works	W72-06735, 06737 06739 -- 06748 06750 -- 06756 06758	20
American Water Works Association Research Foundation, Water Treatment Plant Waste Pollution Control	W72-06816 -- 06817 06819 -- 06823	7
University of Texas, Wastewater Treatment and Management	W72-06838 -- 06864 06866 -- 06868 07099 -- 07109	41
Battelle Memorial Institute, Methods for Chemical and Biological Identification of Pollutants	W72-06837 07129 -- 07162 07164 -- 07176	48
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American Water Works Association Research Foundation, Public Water Supply Treatment Technology	W72-06977 -- 06978 07095 -- 07098	6
Cornell University, Policy Models for Water Resources Systems	W72-06979 -- 06980 06982 06984 -- 06989	9

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B. State Water Resources Research Institutes		
South Carolina Water Resources Research Institute	W72-06601 -- 06602 06605	3
Kansas Water Resources Research Institute	W72-06603 -- 06604	2
Washington Water Research Center	W72-06606, 06608	2
Mississippi Water Resources Research Institute	W72-06607	1
Puerto Rico Water Resources Research Institute	W72-06609	1
Idaho Water Resources Research Institute	W72-06610	1
Kentucky Water Resources Research Institute	W72-06611 -- 06612	2
Utah Center for Water Resources Research	W72-06972	1
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C. Other		
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C. Other (Cont'd)		
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Canada Centre for Inland Waters	W72-06679 -- 06681 06684 -- 06692	12
Forest Service	W72-07067 -- 07074 07076 -- 07083	16

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

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